

OPINION *AND* COMMENT



Changes in Individual Income Taxes Made by the
Revenue Act of 1948

The Business Management Service

How to Buy Stocks and Bonds

Synthetic Liquid Fuels

Trends in Railroad Fuel

Prerequisites for Sound Tax Reform



OPINION AND COMMENT

A QUARTERLY PUBLICATION

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BUREAU OF ECONOMIC AND BUSINESS RESEARCH
COLLEGE OF COMMERCE AND BUSINESS ADMINISTRATION

HOWARD R. BOWEN, Ph.D., *Dean*

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This publication of the Bureau of Economic and Business Research is issued upon the assumption that our readers will appreciate interpretative comments on topics of current interest. Because studied opinions on the significance of current trends are often more thought-provoking than tabulations of data would be, the Bureau supplements its research by issuing *Opinion and Comment* as another type of service.

The opinions expressed in the articles are the personal views of the respective authors and not necessarily those of the College of Commerce or the University.

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Changes in Individual Income Taxes Made by the Revenue Act of 1948

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THE Revenue Act of 1948 was passed over the veto of President Truman on April 2, 1948.

The principal purposes of this law were to reduce the income tax of noncorporate taxpayers and to equalize the burden of the income, estate, and gift taxes as between residents of community property states¹ and other states. The Senate Finance Committee estimated the tax reduction would be approximately \$4.8 billions for a full year, some \$2 billions smaller reduction than under the House bill. President Truman vetoed the bill, because, in his opinion, (1) tax reduction is not justified at this time; and (2) the bill benefits the wealthy to a greater extent than others. There is a strong probability that he was correct in his veto; some Congressmen have indicated that although they favor reduction now, it may soon be necessary to increase taxes again because of the foreign situation.

The Revenue Act of 1948 amends the law from that which was in effect for 1946 and 1947 under the Internal Revenue code, as it was

amended last by the Revenue Act of 1945.

I. Scope of This Article

This article is concerned only with the changes in the income tax provisions. It does not attempt to explain the extremely important changes in the estate tax and gift tax laws, nor the income tax provisions unchanged from those in effect in 1946 and 1947.²

II. Effective Dates of Changes

The amendments in general go into effect as of January 1, 1948; however, the changes regarding the machinery for withholding of tax by employers are effective for wages and salaries *paid* on or after May 1, 1948. Because of the larger withholdings up to May 1, 1948, and because the tax reduction is effective for the entire year, many taxpayers will have to pay less tax in 1948 than they anticipated. If they have filed estimated tax returns for 1948 (Form 1040-ES), they may amend their estimates and pay less on the remaining quarterly installments. If they paid their estimated tax in full on or before

¹ Community property jurisdictions are: Arizona, California, Idaho, Louisiana, Michigan, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, Texas, and Washington.

² The law in effect for 1946 and 1947 was discussed by Edward J. Filbey in "Lower Income Taxes for 1946," *Opinion and Comment*, February 16, 1946.

March 15, 1948, or if they have not filed an estimated tax return, they can recover their overpayments for 1948 early in 1949.³

Taxpayers on a fiscal year basis ending in 1948 will figure part of their tax under 1947 provisions and part under the law as amended in 1948.⁴

III. Taxpayers to Whom Revenue Act of 1948 Applies

Changes apply to noncorporate taxpayers only; corporations are not affected.

IV. Major Changes

Significant changes were made in the estate and gift taxes to give all taxpayers the advantages formerly possessed only by residents of community property jurisdictions. Changes are of such importance that the taxpayer should review and reconsider his program of gifts to be made both before and after his death.

The principal changes in the income tax, all of which tend to reduce tax, are:

- (1) Increase in the maximum amount of deduction for medical expenses.
- (2) Change in the "standard deduction."
- (3) Increase in number and dollar size of exemptions.
- (4) Reduction in tax rates.
- (5) "Splitting" of income between husband and wife.

³ See XVII for additional explanation.

⁴ See XV for additional explanation.

V. Who Must File a Tax Return and When It Must Be Filed

An individual with gross taxable income of \$600 (\$500 in 1947) or more must file a tax return, regardless of his marital status, whether he is a minor or an adult. A return may be a separate return for a single or married taxpayer or a joint return for husband and wife.⁵

The rules regarding the time for filing tax returns have not been changed.

VI. Which Form May Be Used⁶

As in 1947, individual taxpayers have a limited choice as to the form they may use.

(1) Form 1040, filled out completely using a revised calculation similar to that on page 3 of Form 1040 for 1947, must be used if adjusted gross income is \$5,000 or more and may be used at the option of the taxpayer with less than \$5,000 adjusted gross income.

(2) Form 1040, using a simplified tax table similar to that on page 4 of Form 1040 for 1947, may be used if adjusted gross income is less than \$5,000. The table has been revised for 1948, of course, to reflect larger exemptions, lower rates, and splitting of income between husband and wife.

(3) Form W-2, withholding receipt from employer, may be used

⁵ See VIII and XIV for an explanation of joint returns.

⁶ All references to forms are to 1947 forms. Those for 1948 are not yet available but probably will not be changed greatly.

if the gross income is under \$5,000 and is derived solely from pay as an employee, dividends, or interest, and the latter two do not exceed \$100.

VII. Comparative Illustration of Separate Returns for 1947 and 1948

The accompanying illustration is in accordance with the sequence of calculation provided on Form 1040 (as used in 1947), pages 1 and 3, for a full calculation of tax without the use of the simplified tax table on page 4. This illustration assumes a single taxpayer with one dependent.

The following comments should be noted in connection with the portions of the illustration below which bear the same letter designations.

(a) The 1948 Act has not changed the provisions regarding gross income or the deductions permitted

to reduce it to adjusted gross income.

(b) The additional deductions have been changed in two respects. The upper limitation on medical deductions has been increased.⁷ The "standard deduction" allowed in lieu of the sum of these additional deductions and certain other items has been changed.⁸

(d) Each exemption has been increased from \$500 to \$600, and additional exemptions for blindness and old age are provided.⁹

(f) The tentative normal tax and surtax is figured by using the combined normal tax and surtax table on page 4 of the instruction sheet for Form 1040. This is the same table as was used in 1946 and 1947.

⁷ See IX for a more detailed explanation.

⁸ See X for a more detailed explanation.

⁹ See XI for a more detailed explanation.

	1947	1948
(a) Page 3, line 1 Adjusted gross income.....	\$10,000.00	\$10,000.00
(b) Page 3, line 2 Additional deductions.....	1,800.00	1,800.00
(c) Page 3, line 3 Net income.....	\$ 8,200.00	\$ 8,200.00
(d) Page 3, line 4 Exemptions (2).....	1,000.00	1,200.00
(e) Page 3, line 5 Taxable net income.....	<u>\$ 7,200.00</u>	<u>\$ 7,000.00</u>
(f) Page 3, line 6 Combined tentative normal tax and surtax based on amount in line 5		
First \$6,000.....	\$ 1,360.00	\$ 1,360.00
\$6,000-\$7,200 @ 30%.....	360.00
\$6,000-\$7,000 @ 30%.....	\$1,720.00	300.00
(g) Page 3, line 7 Reduction factor:		
1947 — 5%.....	86.00	68.00
1948 — \$ 400.00 @ 17%.....		151.20
1,260.00 @ 12%.....		
<u>\$1,660.00</u>		<u>219.20</u>
(h) Page 3, line 8 Combined normal and surtax.....	<u>\$1,634.00</u>	<u>\$1,440.80</u>
(i) Page 3, lines 9-12 The content of these lines is not changed by the Revenue Act of 1948.		
(j) Page 1, lines 7-10 The content of these lines is not changed by the Revenue Act of 1948, except that the dollar amounts probably will be smaller than under the 1947 provisions.		

(h) Line 8 on page 3 of Form 1040 provides that the alternative tax computed on separate Schedule D shall be used instead of line 6 minus line 7 if the alternative tax is smaller. This provision and the method for calculation of the alternative tax are not changed by the Revenue Act of 1948.

VIII. Comparative Illustration of a Joint Return for 1947 and 1948

The following illustration follows the sequence of calculation provided on Form 1040 (as used in 1947), pages 1 and 3, for a full calculation of tax without the use of the simplified tax table on page 4. This illustration is that of a joint return of husband and wife with no dependents. The comments made regarding the preceding illustration apply also to this illustration.

It is worthy of comment not only that the illustrations in VII and

VIII show a reduction of tax from 1947 to 1948, but also that the "splitting" of income results in less tax on a joint return of husband and wife than on a separate return of a single person with the same taxable net income.

IX. Deduction for Medical Expenses

The only change is an increase in the 1947 limitations of \$1,250 (for a return with one exemption) and \$2,500 (for a return with more than one exemption). Under the 1948 Act the maximum is \$1,250 multiplied by the number of exemptions (not including those for blindness and old age), but not more than \$2,500 on a separate return or \$5,000 on a joint return.

X. Standard Deduction

As in 1946 and 1947, the taxpayer may use a standard deduction in

	1947	1948
(1) Page 3, line 1 Aggregate adjusted gross income of both spouses.	\$10,000.00	\$10,000.00
(2) Page 3, line 2 Aggregate additional deductions of both spouses.	1,800.00	1,800.00
(3) Page 3, line 3 Aggregate net income.	\$ 8,200.00	\$ 8,200.00
(4) 1948 — Divide line 3 in half.		\$ 4,100.00
(5) Page 3, line 4 Exemptions (2).	1,000.00	600.00
(6) Page 3, line 5 Taxable net income — 1947.	\$ 7,200.00	
One-half of aggregate taxable net income — 1948.		\$ 3,500.00
(7) Page 3, line 6 Combined tentative normal tax and surtax based on amount on line 5 and the table on page 4 of the instructions to Form 1040:		
First \$2,000 @ 20%	\$ 400.00	\$ 400.00
\$2,000-\$3,500 @ 22%		330.00
\$3,500-\$4,000 @ 22%	440.00	
\$4,000-\$6,000 @ 26%	520.00	
\$6,000-\$7,200 @ 30%	360.00	
	\$ 1,720.00	\$ 730.00
(8) Page 3, line 7 Reduction factor:		
1947 — 5%	\$ 86.00	
1948 — \$400 @ 17%	\$68.00	
\$330 @ 12%	39.60	\$107.60
(9) Page 3, line 8 Total normal and surtax.	\$ 1,634.00	\$ 622.40
(10) 1948 — Multiplied by two.		\$ 1,244.80

lieu of: (a) the additional deductions on page 3 of Form 1040; (b) the credit against income subject to normal tax for partially exempt interest (see instructions for Form 1040); (c) the credit against tax for certain taxes paid foreign countries or United States possessions (line 9, page 3, Form 1040); and (d) the credit against tax for tax paid at source on tax-free covenant bond interest (line 10, page 3, Form 1040).

In 1947, a flat \$500 standard deduction was allowed (to most taxpayers) directly on returns with adjusted gross income of \$5,000 or more, or an equivalent allowance was made indirectly in the tax tables used for a taxpayer with adjusted gross income under \$5,000 if he used the simplified tax table on Form 1040 (page 4) or Form W-2. Conditions under which the standard deduction may be used in 1948 have not been changed; however, the amount of the standard deduction has been altered.

The 1948 Act allows a standard deduction of the lesser of \$1,000 or 10% of adjusted gross income; however, only a flat \$500 is allowed on separate returns of spouses having over \$5,000 adjusted gross income if they choose to file separate instead of joint returns. These provisions work out peculiarly if two single persons with more than \$5,000 each of adjusted gross income marry. Their combined standard deduction will be less after marriage.

The operation of the 1948 provision may be illustrated by the following tabulation, assuming the use

of Form 1040 but not the simplified tax table:

<i>Adjusted gross income per person</i>	<i>Single person</i>	<i>Each spouse, separate returns</i>	<i>Two spouses, joint return</i>
(1)	(2)	(3)	(4)
\$ 2,500.....	\$ 0	\$ 0	\$ 500
4,000.....	0	0	800
5,000.....	500	500	1,000
7,500.....	750	500	1,000
10,000.....	1,000	500	1,000
\$15,000.....	1,000	500	1,000

Taxpayers with less than \$5,000 adjusted gross income are not allowed a standard deduction directly. To compare the deductions allowed both spouses on separate returns as contrasted with joint returns, the figures in column (3) must be multiplied by two. If two single individuals with \$7,500 each of adjusted gross income marry, their aggregate deduction drops from \$1,500 to \$1,000.

XI. Exemptions

All exemptions have been increased from \$500 to \$600, and two new ones, for blindness and old age, have been added. In 1947, a deduction of \$500 for blindness was permitted under "Miscellaneous" on page 3 of Form 1040. Under the 1948 Act such deduction has been eliminated and has been replaced by the \$600 exemption for blindness, to be taken on line 4 of page 3. Aside from the increase from \$500 to \$600, the allowance of the exemption is more favorable to the taxpayer who uses a standard deduction than was the old deduction.

Exemptions are now permitted for: the taxpayer, his spouse, each dependent, blindness, and old age. For example, six exemptions are

permitted on a joint return, or a separate return of one spouse if the other has no income and is not a dependent on someone else's return, if both spouses are over 65 years and are blind. The old age exemption is allowed if the age of 65 is attained before the close of the taxpayer's taxable year. It is allowed in the year of death if the age of 65 years is reached before date of death.

The exemption for dependents has been increased from \$500 to \$600, but the tests for granting the exemption have not been changed. The principal tests still are: relationship, furnishing of over one-half of support, and gross taxable income of the "dependent" under \$500.

The other rules regarding exemptions remain unchanged.

XII. Tax Rates

The *tentative* normal tax of 3% and the surtax rates used in 1946 and 1947 have not been changed directly. The decrease in tax rates has been accomplished by increasing the "reduction factor" used in reducing the tentative tax to the final tax. In 1946 and 1947 the rate of reduction was 5% (line 7, page 3, of Form 1040). The 1948 reduction factor (which includes the 5%) is: 17% of the first \$400 of tentative tax

on line 6, plus 12% of the excess over \$400 but not over \$100,000, plus 9.75% of the excess over \$100,000 of tentative tax.

According to the Senate Finance Committee, the effective resulting reduction in taxes is as shown below:

The maximum total tax has been dropped to 77% of net income. The maximum tax on net long-term capital gain remains at 50%.

XIII. Capital Gains and Losses

The provisions regarding capital gains and losses have not been changed, but it may be well to explain how the alternative tax computed on separate Schedule D is applied in joint returns.

The calculation on separate Schedule D of Form 1040 (as used in 1947) should be modified, as follows:

(a) Lines 1, 2, and 3 should include aggregate figures for both spouses.

(b) Subtract one-half of line 4 from one-half of line 3 to arrive at line 5.

(c) Calculate line 6 in the usual manner.

(d) On line 7, use the new reduction factor.

(e) Multiply line 8 by two.

(f) From this point proceed as usual.

<i>Taxable Net Income</i> <i>(Less deductions and exemptions)</i>		<i>Percentage of Reduction in Tax</i>	
1. \$2,000 or less.....	12.6%	reduction of tax	
2. \$136,700 approx.....	12.6%	reduction of tax on \$2,000 of income	
	7.4%	on the balance of tax	
3. Over \$136,700 approx.....	12.6%	reduction of tax on \$2,000 of income	
	7.4%	reduction of tax on \$134,700 of income	
	5.0%	on the balance of tax.	

XIV. "Splitting" of Income Between Husband and Wife

In 1947 and previous years spouses who were residents of community property states were given the privilege of dividing their community income (usually earnings and income from community property as defined by state law). They could then file separate returns and pay taxes at lower rates than if the income was reported in a joint return or more heavily in the separate return of one spouse than in the separate return of the other spouse. In discussing revisions of the law in effect in 1947 and prior years, it was suggested that either this privilege be taken away from the residents of a few states or extended to all. The latter alternative was made part of the 1948 Act.

Husband and wife may now split all their income on a joint return regardless of its source, regardless of whether all is income of one spouse, and regardless of their residence. They include their aggregate income and deductions in a joint return, split the net result in half, and from this amount subtract one-half of their exemptions. The balance is subjected to the tentative tax rates and reduction factor. The result, which is the tax for one spouse, is doubled to get the tax for both spouses. Any credits against tax or prepayments of tax are deducted from the total tax for both spouses.¹⁰

Husband and wife may file sepa-

rate returns if they wish, but in most cases their tax will be less on a joint return. It should be noted that the character of a joint return is different from what it was in 1947. In 1947, the tax was a tax on aggregate income. Now it is the sum of the taxes on two separate halves of income.

The principal changes in rules regarding the permissibility of the use of joint returns are as follows:

1. Persons legally separated or divorced are not considered "married." In 1947, separated (not divorced) persons were considered married.

2. Joint returns of the survivor and a deceased spouse may be made; such returns were not permitted in 1947. However, there are certain limitations on this privilege, and the executor or administrator for the deceased spouse may disaffirm such joint return.

The major benefits resulting from "splitting" are:

1. Saving in taxes (the major benefit going to large-income taxpayers).

2. Correction of the inequity of allowing the benefits of the community income provision to some taxpayers only.

3. Reduction of the tendency of some states to introduce hasty community property legislation.

4. Reduction in incentive for "rigging" income-division schemes between spouses.

5. Simplification of income, gift, and estate taxes.

¹⁰ See VIII for an illustration of a joint return.

XV. Returns for Fiscal Years Ending in 1948

The method of calculating tax for a fiscal year which overlaps two calendar years is not changed. Assume that the taxpayers whose returns are illustrated in part VIII have a fiscal year ending on August 31, 1948. They should calculate their tax under the laws for both 1947 and 1948 and use the sum of a part of each result.

	1947	1948
Total tax (see part VIII)	\$1,634.00	\$1,244.80
Multiplied by days in each year.....	122/366	244/366
Tax apportioned.....	\$ 544.67	\$ 829.87
Tax for fiscal year.....	<u>\$1,374.54</u>	

XVI. Withholding Tax

The employer is required to withhold taxes under the provisions of the 1948 Act for wages *paid* on or after May 1, 1948. There is no provision for a refund to the employee by the employer for taxes withheld at higher rates in the first four months or for adjusting amounts withheld in the later months to compensate. A wage earner must wait until 1949 to get his refund for overpaid taxes, unless he amends his estimate of tax on Form 1040-ES.¹¹

The general rules regarding withholding of tax have not changed. Withholding tax tables have been modified to reflect changes in tax rates and in the amount of exemptions but not to reflect "splitting" of income on joint returns. New exemption certificates (W-4) do not

have to be filled out merely because of the Revenue Act of 1948, unless blindness or old age entitles the taxpayer to additional exemptions for himself or his spouse, or unless there is some other change in the taxpayer's exemptions.

XVII. Estimated Tax

Methods of calculation, filing dates, and penalties for inaccurate estimates have not been changed by the Revenue Act of 1948.

The requirements for determining who must file an estimate on Form 1040-ES have been changed to reflect the changes in exemptions. There are two alternate tests to be applied. First, an estimate must be made if expected wages exceed \$4,500 plus \$600 for each exemption (including old age and blindness) *including* the taxpayer's own. In 1947 the rules were: \$5,000 plus \$500 for each exemption *excluding* the taxpayer's own. Second, an estimate must be made if estimated gross income from sources other than wages subject to withholding is over \$100 and total estimated gross income is \$600 or more (\$500 in 1947).

A taxpayer who filed an estimate on or before March 15, 1948, and paid the installment based on the higher tax rates, lower exemptions, etc., in force prior to the passage of the Revenue Act of 1948 may go on paying such installments and obtain his refund in 1949 or he may amend his estimate by June 15, 1948, and decrease his estimated tax and remaining installments to be paid. It will be necessary for him to (1) re-

¹¹ See XVII.

compute his total estimated tax; (2) recompute the estimated amount to be withheld by his employer; (3) subtract (2) from (1) to get his balance of estimated tax; (4) subtract from (3) the installments already paid; and (5) spread the remainder over the June 15 and September 15, 1948, and January 15, 1949, installments.

A revised Form 1040-ES has been prepared and distributed by the Treasury Department to facilitate

the use of revised estimates for 1948.

XVIII. Trusts and Estates

A return must be filed for estates with gross income of \$600 (\$500 in 1947) or more, and for trusts with a net income of \$100 or more, if gross income is \$600 (\$500 in 1947) or more. Estates are allowed an exemption of \$600 (\$500 in 1947) and trusts are allowed \$100, as in 1947.

High Cost of Corporate Living. In all that is said about "Corporate greed" and high prices, it is well to bear in mind that there is such a thing as the high cost of living for the corporations and their shareholders as well as for everybody else.

Corporate shareholders do not usually get much sympathy, on the theory that they are nothing but "old money-bags" anyway. Actually they include hundreds of thousands of persons in modest circumstances, as well as schools, colleges, hospitals, and charitable institutions of all kinds. The dividend payments have of course been increased by many companies, but in the aggregate have barely kept pace with the increase since prewar in the cost of living. On the other hand, total corporate wage and salary payments have increased much more than dividends, and average weekly earnings of factory workers stand well ahead of the rise in the cost of living since prewar.—From the March letter of the National City Bank of New York.

The American System. During the 1930's we were told by our "liberals" that the American private enterprise system had reached its maturity, was all washed up, and needed to be replaced by a planned economy. Yet it was this "decadent" system that Russia and all of the other allied countries called upon in their hour of dire peril to provide them with weapons and tools and equipment. America, in fact, became the "arsenal of democracy" and the prodigious flow of planes, guns, and munitions from our factories astounded even the taciturn Stalin, who was impelled to remark: "Without United States machines the United Nations could never have won the war." Then after the war was over, it was to this country that the stricken nations turned for relief and rehabilitation.—From *New England Letter* (First National Bank of Boston), March 31, 1948.

The Business Management Service

EARL P. STRONG

Director, Business Management Service, University of Illinois

Purposes

THE purposes of the Business Management Service of the College of Commerce and Business Administration are:

A. To offer a comprehensive service to businessmen in the various areas of business management through surveys, analyses, consultations, and dissemination of the results of research conducted by members of the staff of the College and by others. Such service contributes to better management and reflects itself in added service to customers and in improved business conditions for the citizens of the various communities in the State.

B. To obtain for the College of Commerce and its instructional and research staffs a more complete understanding of the management problems of the businessmen of Illinois. Such problems and proposed solutions can be integrated into the regular teaching and research programs of the College.

It has been concluded in view of these two basic purposes—one to the direct benefit of the communities in the State, and the other to the direct benefit of the University of Illinois—that the needs of both can be met by organizing and offering a service to businessmen on a basis similar to that offered to the farmers of the State since 1914 through the College of Agriculture.

Need

The American business system is made up of many kinds of business firms—both large and small. These firms are today beset with numerous problems, of which **MANAGEMENT** is the most urgent. This fact is recognized on all sides, but the demands on the modern businessman are so great that it is practically impossible for him to be well-informed and skillful in *all* the major phases of business management. He must, therefore, depend upon various direct aids and sources of information, both within and outside the business, to assist him with his general and specific problems.

Business firms, particularly small businesses, can obtain management aid from a number of different sources. The businessman should become fully acquainted with available sources and would profit by using them to the fullest extent.

General Types of Service

In operating his enterprise, the businessman should realize that there is now in existence much valuable information on techniques of management. This information is obtainable from many and varied sources which can assist him in handling his business management problems so that the operations of his establishment will be more satis-

fying to him and more serviceable to his customers and his community.

The Business Management Service has been organized to serve business firms in the State in the following ways:

1. *Local Clubs and Associations.* Promoting, organizing, and assisting local Chambers of Commerce, service clubs, and trade associations in furthering improvement in business service and efficiency through community programs. This includes actively engaging in conferences with business groups involving meetings, talks, and discussions on a variety of management topics of interest to businessmen, their customers, and their employees.

2. *Research.* Collecting and making available research findings in the field of business that will have particular value to Illinois businessmen and their customers.

3. *Extension Courses.* Promoting, organizing, and offering non-credit and regular credit extension courses in those business subjects for which there is a demand or need in a particular locality. These courses, organized to meet the specific needs and demands of businessmen, will be taught by persons qualified to teach a particular subject, either regular College of Commerce staff members, or other teachers or businessmen who are qualified by training and experience. Such extension courses will be offered in cooperation with the University Extension Division.

4. *Management Counseling.* Offering management counseling service to firms that request it. This

type of activity is of necessity limited by the number of staff members that are available and the extent of the counseling necessary. The service is limited to advisory consultation only. Wherever possible, work will be done with trade groups and by communities. (In many cases, suggestions will be made to retain professional assistance, e.g., auditors and accountants, attorneys, management consultants, or market research firms.). Reports covering the problems that are encountered, techniques used in their solution, and the results will be made available to College of Commerce staff members for use in classroom instruction, research, or professional writing. The names of business firms will not appear on circulated reports and every effort will be made to safeguard confidential information.

5. *Publications.* Writing and distributing publications on general and specific management problems and topics of interest to businessmen of the State. These publications will be written by College of Commerce staff members and Business Management Service staff members either as independent projects or in cooperation with business enterprises or business groups.

The Business Management Service also assists business enterprises in procuring pertinent information on business management from various sources and interprets it when necessary. Such information that is normally contained in printed material is kept on file, classified by

types of business enterprises. Those who make inquiry will be advised of the sources of such material. Typical of the types of business management information available are:

1. Pamphlets and booklets published by manufacturers and suppliers of products and services.

2. Business guidance materials offered by trade associations.

3. Publications of Federal, State, and local governments.

In summary, services will be made available to the businessmen of the State of Illinois through:

1. Group meetings and conferences with businessmen.

2. Extension classes for businessmen.

3. Correspondence between staff members and businessmen.

4. Personal visits of staff members to business firms.

5. Publications on general and specific business management problems.

Specific Areas of Service

The specific areas of service include those management fields that are commonly found in most business firms. While these areas vary in importance in direct relation to the size of the business firm, they do exist in most organizations. They include:

- Administrative Management
- Building and Space Management
- Factory and Production Management
- Financial Management
- Office Management
- Personnel Management

Purchasing and Warehouse Management

Sales Management

Records Management

The services of the Business Management Service are offered, in general, without charge. In those cases in which there are small charges for the publications distributed (e.g., U. S. government publications), the cost will be passed on to the business firm which requested the materials. Also, in cases involving extension courses, the normal fees usually charged for such courses by the University Extension Division will be charged. Except in these instances, the Service is offered without fees of any kind. Whenever the extent of the work involved justifies a fee, it is recommended that professional organizations be retained.

Further, this service is necessarily limited to businessmen and business enterprises in the State of Illinois. Publications will be sent outside the State when they are requested. Such requests, however, will be honored only after business firms in the State of Illinois have been adequately supplied.

Organization

The College of Commerce and Business Administration of the University of Illinois is sponsoring this program. This College has for many years served the citizens and businessmen of the State of Illinois in several ways. Now, in addition to the past service of the College in offering: (a) instruction in commerce subjects and (b) research

on business and economic subjects, it is prepared to offer a third service, (c) that of furnishing management aids to business organizations throughout the State. Consequently, the College of Commerce and Business Administration is the FIRST in the United States to offer such a comprehensive program of service to business firms within its area of responsibility. In summary form, it offers:

1. Instructional service through courses in business and economics.
2. Research on business and economic problems.
3. Business management services.

The Business Management Service is under the direction of the

Dean of the College of Commerce and Business Administration. The responsibility for its administration and operation is vested in a Director, who has under his supervision a staff of persons qualified in various areas of business management. The expansion of this staff will depend largely upon the demands made upon it by businessmen and the effectiveness of the service that is rendered.

Businessmen in Illinois who desire information and counseling on their business management problems may address their correspondence and requests to the Director, Business Management Service, 112 David Kinley Hall, Urbana, Illinois.

Financial Condition of Business. While the current level of general business activity, through its impact on earnings, remains the dominant influence affecting the financial conditions of individual firms, many financial problems are arising currently because of a return to more competitive conditions and because of unfavorable sales trends in particular business fields. Who will finance the carrying of inventory, for example, is becoming an important problem in some lines, e.g., household appliances and women's apparel. This is particularly true where shortages of goods are easing, and a good deal of the control over inventory and payment terms is being shifted from manufacturers and distributors to retailers and others closer to the consumer. Moreover, the slackening of cash sales generally, itself a sign of growing financial strain, and the resultant rise in credit sales are causing a larger need for funds among firms which have been relying upon a rapid turnover of goods and receivables to finance their operations.—From *Business Conditions*, Federal Reserve Bank of Chicago, April, 1948.

How to Buy Stocks and Bonds

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Introduction

THIS article will not reveal to you any secret shortcuts to making a fortune in investments. We do not know any shortcuts. Handling investments is not a black art but a matter of taking a few precautions, exercising constant care, and then using your common sense. Admittedly there is also an element of luck involved, but it is our observation that the persons who use care and good judgment enjoy most of the luck.

You have worked hard to accumulate the savings you are planning to invest, or at least your father or your husband has worked hard. Don't invest the money on a tip or a hunch or because of an intriguing name. Make up your mind now that you must work to keep your savings. Use the same precautions in buying investments as you would if you were buying a farm, a house, a business site, or even a car. For example, if you were buying a farm you would have the soil tested; you would find out what crops the previous owner raised, what returns he got, on the average, over a period of years, the condition of the fences and farm buildings, whether the land was flat

or rolling, its drainage, and much other information. If you were making a mortgage-secured loan to a farmer, you would make a similar searching investigation of the property and the borrower's character. If you intend to buy stock, which is the same as buying a share in a business, or if you intend to buy a bond, which is the same as making a loan to a business, you should make similar thorough investigations.

This article will outline a sensible course of procedure for you and tell you where and how to find the information you need. The basic questions to which you should have the answers are:

- (1) For what purposes am I investing my money?
- (2) Do I anticipate that the price level will rise or fall?
- (3) What are the best industries in which to invest?
- (4) Which are the best companies in those industries?
- (5) What should I know about each of my investments?
- (6) What should I know about ordering investments?
- (7) How should I watch my investments?

Why Are You Investing?

For what purpose do you want to invest this money? That will determine in large part the type of investments you will select. You probably fall into one or more of four basic classes of investors.

First, you may be saving in order to have cash on hand for bargains when some future opportunity presents itself. Andrew Carnegie and John D. Rockefeller made some of their best purchases in a depression period. They always kept sizable cash balances and were in a position to buy cheaply when others were being forced to sell. Lest you find the analogy implausible though flattering, remember that anyone can do this on a modest scale. If you have such ideas in mind, you want an easily liquidated investment and should put your money into a savings account or short-term government bonds. The interest return is low but that is not where you expect to make your profit.

Second, you may be setting your money aside for your old age or for your children's education. You may be a widow and this is your "all." In that event you want more than anything else to conserve the principal. You should therefore prefer safe and presumably low-income investments. Do not for a moment permit the lure of higher income to attract you away from the haven of safety. You simply cannot afford the risk.

Third, you may wish to support yourself wholly, or in part, from the income that your savings yield.

If this is true, you will tend to invest some of your savings in somewhat higher-yield and therefore somewhat less conservative investments. The more you are inclined to worry, however, or the more dependent you are on this income, the more you should be content with a modest income from safer investments.

Finally, you may be interested primarily in increasing your savings by buying investments whose value on the market is likely to increase. If this is your chief consideration, you will place some of your savings in somewhat riskier investments or investments which may offer low returns but good long-term growth prospects. But again, if you are easily worried, or would be helpless without the money, you should not consider this course of action, for even at best the planning for capital growth is difficult. Can you afford it? That is the question you must answer before taking these risks.

When you have decided in which of these groups you belong, you will be in a better position to decide what sort of investments to buy and what sorts of industries you should prefer. At the present time, however, another factor has an important bearing on the sort of investments and sort of industries you should favor. This is the risk of a noticeably changing price level.

Is There Inflation or Deflation Ahead?

Which direction do you believe the price level is going to take?

Will we have rising prices for several more years, or do we face a depression and a period of falling prices such as has followed every war? Perhaps you reply that you are no expert, that better men than you seem to be guessing at that one, and that you feel unqualified to give a good answer. Unfortunately, you must make a decision, or at least you must decide whose answer to accept on this controversial question. After all, it is your money and you cannot dodge the responsibility for it. Your decision will dictate in large part what type of investment you will choose.

If you think prices are going down, you will lean towards high-grade short-term bonds, or you may even consider keeping your funds in a savings account. Or you may prefer to hold cash and forego income in order to be in as safe and liquid a position as possible, reasoning that the increased purchasing power of the dollar will be ample return for you. You conclude that this is the surest way to increase the value of your principal. You avoid common stocks.

On the other hand, if you think prices will continue to rise for some time, you will lean towards stocks. Stocks are a share in the ownership of a company. Thus if prices rise and business is stimulated, the return from dividends will tend to rise and the dollar value of your share in a thriving and more valuable business will tend to rise also. That is not to say that stock prices rise step by step with the price level—they do not—but over a

period of time they will tend to rise. Stocks are better than cash, which returns no income and whose purchasing power declines as prices rise. Hoarding or relying on a savings account is, in reality, a bet that prices will not rise.

Perhaps you cannot make up your mind which way prices are going to move. At present, many people think that this year will usher in a depression, which belief indicates they should invest in bonds. Yet they fear they may be wrong and that the price level may continue to rise, and to rise noticeably for several more years. They would like an investment that would protect them against the worst effects of either of these possibilities. Investments known as convertible preferred stocks and convertible bonds are a partial hedge.

To understand the convertible preferred stock you must know how company earnings are distributed. Owners of the securities of a company are paid in the following order. Bondholders' interest must be paid first or the company will be threatened with bankruptcy. The preferred stockholders' dividends will be paid next if earnings are large enough. The rate of return on preferred stock is generally fixed. Last to be paid, but most favored when times are good and earnings are large, are the common stockholders. They get a big share of what is left after bondholders and preferred stockholders have been cared for. Now the advantage of the convertible preferred stock, assuming that it is high-grade, is that it provides partial

two-way protection. If a depression sets in and prices fall, the dividends on preferred stocks are more likely to be maintained than those on the common stock. Even if not maintained, they will be restored before dividends on common stock. Thus the market value of preferred stock does not decline as much as that of common stock although it will probably go below that of bonds. On the other hand, if prices continue to rise, common stocks will tend to rise in value, and in that event the fact that the stock is convertible into common stock will raise the value of convertible preferred. Convertible bonds also perform the same function, although at present there are not many good ones from which to choose.

Another way of resolving your uncertainty as to whether the price level is going to move up or down is to divide your holdings between bonds and common stocks. You may put half your money into bonds lest prices fall, and half in common stocks lest prices rise. If you have the courage to do so, you will be wise to hold to this proportion, or to whatever other proportion you select, rather rigidly. If prices continue to rise and common stocks go up in value, you can then sell some and put the money into short-term bonds or cash. Thus, if a crash takes you by surprise, you have saved some of the profits of the pleasant prosperity.

On the other hand, suppose that prices fall. While your high-grade bonds may decline, your common stocks will fall sharply. Later you can sell some of the bonds and in-

vest the money in common stocks at a more propitious level. Thus, when stocks start to rise again, as they eventually will, you will be among the first to profit. It takes courage, however, to follow such a program as this. It means you must do the opposite of what most investors are doing and you will be tempted to go with the crowd. Furthermore, it may take months or even years of patient waiting before you reap the gains of your rather contrary policy. Had you sold some of your stocks in 1928, you would have waited at least one year—until the 1929 crash—before the wisdom of your action would have been manifest. Meanwhile you would have had many day-to-day doubts. And had you bought stocks in 1932, you would have waited about a year before the wisdom of that action would have become apparent.

What Are the Best Industries to Invest In?

We have talked in generalities up to this point about the merits of bonds, common stocks, and convertible preferred stocks and bonds. Now the question is: What are the best industries to invest in? First of all, look over the economy of the nation. You should pick the businesses which are likely to do well in the future you foresee and which are not too risky for you to be involved in.

All that can be done here is to make a few suggestions about the industries to choose. If you expect that the price level will continue up for some time, then avoid indus-

tries whose prices are likely to be regulated or controlled. Their profits may be squeezed thin between rising costs and price ceilings. Railroads had been having a difficult time until recently, because the Interstate Commerce Commission did not increase their rates as fast as their costs went up. Public utilities faced the same problem. Choose instead industries the prices of whose goods or services may be raised without delay and without curtailing the demand appreciably. The automobile industry is a good example. Oil is another.

If you expect the price level to be fairly stable, then choose industries that make goods for which there is now a pent-up demand, such as building materials, automobiles, and perhaps railroad equipment. Also desirable are industries enjoying a rapid growth, such as the chemical and proprietary drug industries, or industries whose raw materials are scarce, such as oil or non-ferrous metals.

If you expect prices to fall, keep away from stocks and invest in short-term high-grade bonds, presumably governments.

If you see labor troubles ahead, such as occurred in 1946, it is wise to invest in industries in which labor costs are relatively small. In view of the growing strength of organized labor in recent times, some investors confine themselves almost entirely to such industries. In this category fall the tobacco, drug, food, beverage, chemical, utility, and oil industries.

If you anticipate another war soon, then you should consider such

wartime favorites as airplane manufacturing, automobiles, steel, non-ferrous metals, oils, and chemicals. You should, however, bear in mind two probable characteristics of the next war. Parts of America may be destroyed, and industries may be virtually "drafted" as men have been in the past. You should pick industries whose plants are scattered and you should actually not expect too much in the way of war profits. Stocks may be profitable in the preparatory period for war but once war is under way, fear, uncertainty, and higher taxes tend to depress stocks.

Finally, you may be interested in a good income regardless of some risk. Fairly consistent performers in the past have been the better companies in the utility, insurance, food, soap, oil, proprietary drug, and tobacco industries. Investments in the steel, non-ferrous metals, and railroad equipment industries may earn and pay even better dividends in good times, but their earnings can fall off alarmingly fast if economic conditions change.

It should be obvious that many industries have not been catalogued, but by looking into the records, which we shall tell you about, you can classify some of them yourself.

The Advantages of the Investment Trust

In general you should limit yourself to investments in a few companies in a few industries, so that you can watch them more carefully. Possibly you will object to this idea of a few investments on the ground that it is like putting all your eggs

into one basket. There is, of course, a happy medium between too great concentration and too great diversity of investment. The danger of diversity lies in not being able to watch your investments; the danger of concentration is that you may be so unfortunate as to choose an unprofitable or less profitable company. If you are unwilling to try to strike this happy medium yourself, or are aghast by this time at the number of critical decisions you have to make, there is an easier way out for you. It is provided by companies known as investment trusts.

One kind of investment trust buys a wide variety of bonds, common stocks, and preferred stocks and has a staff of experts to watch those securities carefully. The investment trust will sell you some of its own shares of stock. These represent a participation in its broad list of investments. If the trust's selection of securities is good, you should receive an adequate return. If the investment trust makes poor choices, the opposite will happen. Actually it is more likely to do well than badly because it has expert advice. Also, even if a few of the securities held by the investment trust prove disappointing, others will probably do better than anticipated. You will thus have the advantages of diversity.

A second type of investment trust stock gives you the opportunity to invest in one or more of several industries. Suppose you believe that the building materials industry has a great future ahead of it but have no idea which building materials

companies have the best prospects. You may buy stock in the building materials group of an investment trust. This group may include the stocks of ten to twenty companies, say two lumber companies, three cement concerns, a plywood company, a paint company, two or three roofing companies, a hardware company, a lock company, two or three furnace companies, and a few bathroom fixture companies. Such an investment will give you more diversification than you could otherwise afford with your modest savings or watch over with your limited time and knowledge of such matters. If one of the cement companies, as an example, began to experience poor earnings, the investment trust experts who are watching for such misfortunes would probably spot the trouble long before you would; they would sell the stock and buy something else in its place. Furthermore, you may invest in a few other industry groups—say oils, tobaccos, automobiles, and chemicals—and obtain similar diversification, as well as the benefit of expert guardianship, in each of these.

The investment trust of course has a few disadvantages. Sizable costs for marketing and management are included in the purchase price. You will find also that it is expensive to shift your investments from, say, the building materials group to the oil group. And you do not have the fun of picking and watching your own investments; someone else is doing it all for you.

If the investment trust idea appeals to you after you have weighed

the advantages and disadvantages, ask your broker to recommend a good one.

You may gain some of the advantages of the investment trust and still preserve your freedom to move cheaply if you invest in one of the nation's really big companies with diversified interests. For example, duPont de Nemours makes chemicals, nylons, fertilizers, gunpowders, and owns a quarter of General Motors. The big insurance companies also have their funds widely invested. Fire insurance companies have large holdings in common stocks and casualty companies favor fixed-income investments.

What You Should Know About the Bonds You Buy

By now, you may have picked four or five industries and are ready to look for one to three companies in each industry to invest in. We shall also assume that you intend to buy both bonds and stocks. Let us look at bonds first because they are usually considered safer. Bonds are a debt, and the stipulated interest must be paid on them on pain of bankruptcy. You will want some of your savings in bonds. The safest bond today is the short-term (one year) government bond. A government bond of somewhat longer maturity that is especially recommended by trust companies because of its many advantages is the Series G. Although the income on these is low, remember that you are buying them for safety, not income. In fact, so long as you are buying bonds for safety, buy only

the best. There is no substitute for quality, and quality alone provides the protection that you are seeking.

We shall assume that the other bonds you buy are issued by industries, railroads, and utilities. There are certain other fundamental facts you should know about any bond that you buy. Several of these will be named and discussed briefly.

(a) What does the company make? How big and how old is the company? Has it a long history of financial success? Did it come through the previous depression satisfactorily? Is the management reliable and alert? Is the company still growing? Do not be misled by the company's name. For example, duPont is far more interested in automobiles than in gunpowder; Canada Dry Ginger Ale is not just a soft drink company; Bendix Aviation makes a wide variety of automobile parts, and no washing machines; and Seaboard Air Line is a railroad. You cannot guess intelligently as to your company's future, including its ability to pay its debts, unless you know the answers to some of these questions.

At this point you may be saying that all these questions are very fine, but after all where can the answers to them be found. You have only the vaguest idea where to look. You do not know the names of the best companies in some of the industries you have chosen. You will find the answer to this question and others in ponderous security manuals. These manuals are not so difficult to use as you may imagine, and you should learn where they are to be found and how to use

them. They contain the most reliable information that is readily available. Since the information may save or make you many dollars, you should seek it out. There are two major houses that publish such manuals. One is Moody's Investors Service; the other is Standard and Poor's Corporation.

Moody's puts out a Railroad Manual, a Utilities Manual, an Industrials Manual, a Governments Manual, and a Bank and Finance Manual. Moody's manuals are published once a year but are supplemented with semi-weekly loose-leaf circulars that are alphabetized and periodically indexed. The circulars carry quarterly earnings statements and any news item of financial interest about the company. If a company gets a large order or borrows from a bank, that fact is promptly reported.

Standard and Poor's lumps railroads, utilities, banks, and other companies all together, alphabetizes them by industrial groups, and publishes the material in several loose-leaf manuals. This service keeps its information up to date by sending out new loose-leaf sections to replace the old ones.

Both these services are expensive, but it is not necessary that you buy them. You can probably find one, and perhaps both, of these sets of manuals in the office of your local broker or investment counselor, or of your local trust company. If there is a college or university library in your community or a large public library, it also may have a set.

If you wish to look over the

names of the companies in various industries, turn to the list of companies by industries in the blue-paged section in the middle of Moody's *Industrials*. Next look up the company whose bonds you are thinking of buying. The manual will tell you when the company was founded, what it makes, what subsidiaries it has, who the principal officers are, when the company had its greatest growth, and how fast it is growing. The last can be determined by looking at the company's earnings statements for back years. The manuals contain a mass of facts by which you can judge the company and see whether it is as good, better, or worse than you supposed. But what are some of the other facts you want to know about the bond you are considering?

(b) Does the company ever have difficulty in earning the interest it must regularly pay bondholders? That is a crucial question. To answer it, look up in the manual the figure showing the number of times fixed charges were earned. Notice especially how well the company did this in the last depression. If you check on this in older manuals for the years 1929-33 and find the company did even moderately well, it is a good omen.

(c) Is your bond a senior security? If so, in case of bankruptcy or receivership, it will have a prior claim on the company assets. Since you are buying bonds for safety, you will presumably want only a senior security, or at least a bond that is virtually that. You can determine those facts from the manuals. Incidentally, along with bonds

you may often see "debentures" mentioned. A bond is usually secured by a mortgage on some specific property of the company, whereas a debenture is merely the unsecured debt of a company. Thus any given company's secured bonds tend to be better than its debentures.

(d) Is your bond listed on the New York Stock Exchange's bond market? The investment manual will tell. If it is listed on this market, you will be able to follow it more readily. The daily quotations of the bond market reflect the judgment of the financial world as to its value and help keep you posted on what interested financial experts think of it.

Both Moody's and Standard and Poor's have rating systems for bonds. These ratings appear in the manuals, and also in monthly pocket-sized bond booklets for quick reference. Although the ratings indicate the experienced judgment of the manual companies' experts, they should be taken only as a guide and not blindly accepted. There is often a time lag before ratings are changed to reflect changes of conditions. Do not accept them without looking up the facts on the company yourself, for it is market prices, not manual ratings, that pay off in dollars.

(e) What is the yield on your bond? This is much more important than its nominal rate of interest. For example, if a \$100 bond had no maturity, paid \$3 a year, and sold for \$50, its yield would be 6 per cent, since \$3 is 6 per cent of \$50. But bonds usually do have

a maturity. A bond due in 30 years, paying \$3 a year, and selling for \$69 has a 5 per cent yield. (Incidentally, although bonds are quoted in hundreds, they are best bought in \$1,000 units.) The matter of yield is complicated, and the simplest thing to do is to consult one of the financial weeklies, such as *Barron's* bond section. *Barron's* has each bond's yield all figured out for you. Standard and Poor's monthly bond guide also does this. Or your broker can figure it out for you from a book of bond yields.

Two basic economic factors affect the yield of a bond — the company's prospects and the general interest rate. If the company's financial prospects are good, the yield will be low; if they are poor, the yield will be high. Since you are buying bonds for safety, you will be suspicious of a high yield. You know that top quality and high income rarely mix. At present (1948) you should not expect more than 3 per cent on safe corporation bonds of distant maturity, 2½ per cent on long-term governments, and slightly more than one per cent on one-year government notes or on top-quality corporation bonds about to mature.

The other economic factor affecting the yield is the general interest rate. As a rule, when the price level rises, the interest rate will likewise rise. In order for a \$1,000 bond paying \$30 a year to yield 4 per cent to the investor, he must be able to buy it below \$1,000. How much below depends, as already indicated, on how near to maturity the bond is. As we all know, prices have been rising, and interest rates

are now tending to do likewise. If prices continue to rise, bonds will tend to fall. In short, a higher yield on bonds these days may be a danger sign of inflation. Stocks, not bonds, are to be preferred in such a period. Certainly, if you are going to hold some bonds, as of today they should be the short-term variety—one to five years. Such bonds give you greater freedom of action.

(f) Is the bond near its maturity date? The newspaper quotation will tell you this. "Pennsylvania Railroad 3½ '85" will pay \$35 on \$1,000 each year and be paid off in 1985. If the bond has a distant maturity and for some reason its market value drops, you will be in the unpleasant dilemma of having to sell at a loss or of having your funds tied up in that security until maturity time approaches. When economic conditions are uncertain, it is best to buy one-year government bonds.

(g) Does your bond have a call price, that is, a price at which the company may buy it back from you on short notice? If so, do not, as a rule, pay more than the call price for the bond. Moody's or Standard and Poor's manuals will tell you at what prices the bonds may be called each year.

(h) Does the bond issue have a sinking fund provision? Your investment manual will tell. A sinking fund is a desirable feature, for it makes repayment of the bond more certain and tends to stabilize the market for the bond.

What You Should Know About the Common Stocks You Buy

Normally, savings invested in bonds represent your "defensive" capital whereas savings put in stocks are your "aggressive" capital. Lately stocks have yielded a better income, and so long as prices continue to rise, they are in some respects the wiser investment. In any event, we shall assume that you intend to buy some stocks. That would make you a part owner of the company in which you hold stocks, although you will have no actual share in the management. You should know many of the same things about the company in which you hold stock as you should about the company whose bonds you have bought. Moody's manuals and those of Standard and Poor's will provide you with the information. Another excellent service to consult is *Standard's Listed Stock Reports*. These appear periodically, one for each investment. Your banker or broker probably keeps them filed in his office. They tell of the company's earnings and prospects, show graphically the trend of the market over recent years, the trend of the industry, and of the company within that industry. A sketchier picture of the company can be had from Standard and Poor's monthly pocket-size *Stock Guide*. You can follow developments by means of a stock guide, but you should not rely on anything so inadequate in planning your investments.

These are some of the questions you should be able to answer about

the companies whose stocks you decide to buy.

(a) Again, how big and how old is the company? What does it make? Is it still growing? How did it fare in recent depressions? The big manuals can answer all these. Another question that should interest you is whether the management is reliable and alert. You must rely on your powers of observation and your common sense to tell you that. Your broker, banker, or investment counsellor may be able to help you, too. You can pick up considerable information by reading the financial page of your metropolitan newspaper. More helpful, if you will read them, are financial journals like the *Wall Street Journal*, the *Chicago Journal of Commerce*, the *Journal of Commerce* (New York), *Barron's National Business and Financial Weekly*, the *Commercial and Financial Chronicle*, or *Business Week*. All kinds of information about various companies are reported in these. Your authors especially recommend the *Wall Street Journal*. *Fortune*, also, has some fine write-ups of big companies, the products they make, and the men who manage them. And you must keep your ears open for such significant facts as that the X Mail Order House retires all employees at 60, or the Y Manufacturing concern has had no labor troubles for 25 years.

(b) Does your company also have several bond issues outstanding, has it obtained a large loan at a bank, or put out several issues of preferred stock? The holders of all these prior obligations will have to

be taken care of before you receive any dividends. You are in the safest position if your company has no sizable bank debt and no bonds or preferred stocks. You will probably participate early in any sizable profits the company makes. Your manuals will tell whether your company has other securities outstanding. So will your stock guide booklet.

(c) Is your stock listed on the New York Stock Exchange or the New York Curb Exchange? These are the first and second most important markets for stocks in the nation. No other exchanges compare in importance with them. If your stock is listed on them, generally speaking, you can sell it more readily than if it were not so listed. You would do well to limit yourself largely, if not entirely, to stocks listed on these two exchanges. Your manuals or the stock guide will tell you where your stock is listed.

(d) What is your company earning? Your stock guide booklet, *Barron's*, or the *Commercial and Financial Chronicle's* financial section will supply the current information. Most companies report their earnings quarterly about two or three months after the quarter is past. Such reports may be published in the financial section of your newspaper. What were your company's earnings over the past years? Consult your big manuals for this information. They will usually show you how the company fared in a depression. Have the earnings been consistently good? Does your company enjoy a feast or a famine in

earnings as the steel companies do, or a more steady diet as the tobacco companies do? Are the earnings increasing or tending downward? Are dividends consistently paid? When did the company last fail to pay any dividends on its stock?

You should be especially interested in your stock's yield. A stock selling for \$30 a share and paying \$1.50 in dividends each year has a yield of 5 per cent — \$1.50 is 5 per cent of \$30. You can easily calculate the current stock yields yourself by dividing this year's estimated dividend by current price. If your stock has a high yield, that is a danger signal, for if speculators thought the dividends would continue they would bid up the price of the stock. You might do well to ask yourself what the average dividend was over the last ten years. You can find this information in the big manuals. Then see what yield this would give in terms of the present price of the stock. If it is good, you will tend to buy; if not, you probably won't.

(e) What has been the market behavior of your stock? Is it steady or volatile? If the prices vary a lot, your chances of both profit and loss are greater. Your chances of loss are especially great if you are buying stock at a price near its high. The blue paper section in the middle of Moody's *Industrials* is a handy place to look up the high and low prices for all industrial stocks each year for the past ten years.

Do not be tempted to buy low-priced stocks because they appear cheaper. Do not think that 80 shares of a low-priced stock are neces-

sarily better than 8 shares of a high-priced stock. Low-priced stocks are more likely to be of poorer quality.

Of course the importance to you of some of the factors discussed here will vary with your purpose in investing. If you seek income, yield will mean a lot; if you seek safety, steady market behavior will count heavily with you.

What You Should Know About Preferred Stocks

First of all, you should have some good reason for buying any preferred stock at all. If it is safety you want, you should seek it in bonds. If it is income and capital growth you want, seek it in common stocks. Preferred stock is not so safe as bonds nor so profitable as common stocks. At present, there seem to be good reasons for buying high-grade convertible preferreds, as has already been indicated. The ordinary preferred stocks, however, seem doomed to decline if a depression comes or if inflation continues. If interest rates rise, these stocks will fall for the same reason that bonds will fall—in order to give the buyer a yield to correspond with the higher interest rates. And ordinary preferreds will not participate in higher profits if good times continue. Because convertible preferreds are more attractive at the time this is written, they tend to have lower yields—about $3\frac{1}{2}$ per cent for safe issues—whereas high-class ordinary preferreds currently yield around 4 per cent.

If you still decide to buy some

preferred stocks, or some convertible preferreds, you should know the answers to the same questions we have outlined for common stocks. Be sure the preferred stocks you buy are of top quality, for you are buying them largely for safety. You should not invest in the preferred stock of any company which has a sizable bonded indebtedness, for interest on this must be paid before your preferred stock gets anything.

There are other features of preferred stocks you should know about. For example, is the preferred stock cumulative? That means that if earnings do not justify a dividend in any year, the stock will pay you that back dividend later, before the common stock receives any dividend. That is obviously a desirable feature. Is the preferred stock participating? In other words, if earnings are high, does the preferred stockholder share in additional earnings along with the common stockholder? This also is a desirable feature, but few preferred stocks are participating. Is the preferred stock callable by the company? If so, at what price? Is it selling above that price? Is there perhaps a sinking fund set up to accumulate money to pay off the preferred stock? Preferreds with sinking funds tend to be rated higher than those without sinking funds. Finally, is the preferred stock convertible? Of late, many new preferred stock issues have been. The terms of conversion are usually complex; therefore have your broker or investment counsellor explain them to you. You should note especially whether the stock is selling above

the conversion point—if so, it is virtually a common stock; or far below the conversion point—if so, conversion has little meaning. Observe also whether the privilege of conversion has expired. The answers to all these questions can be found in the big manuals.

Convertible debentures are even better as a partial hedge than is the convertible preferred stock. If prices fall, the convertible debenture has the protected status of a debt, albeit an unsecured debt. And if prices rise, it can be converted into common stock. Unfortunately, very few prominent companies have convertible debentures on the market at present. The near future, however, may see more of these companies issuing this type of security. Apply the same tests to them that you would to bonds and convertible preferred stocks. Ask your broker or banker to explain the terms of conversion.

How to Go About Buying Securities

You will buy your securities through your bank or through a broker. If you have not already consulted someone experienced in the selection of securities, you should do so at this point. If you buy through a bank, consult the person in the bank's trust department who buys securities; he will know most about them. Your broker may also give you some good advice. If he calls himself an investment counsellor, it means he is more than just a broker—he is a student of investments. He makes a

business of studying investments, his clients' financial needs, and how best to correlate them. He charges a fee for this service, but if he is skilled and experienced, his advice may be worth many times the cost. For example, he may be able to tell you more about the character of the management of a company than the manuals will reveal. He can also interpret the company's balance sheet for you. This may show, for example, that the company's inventories may be dangerously high, or that it may soon have to resort to further financing (a bank loan or a bond issue) to secure adequate working capital. Such an analysis is just as important to you as the company's periodic earning statements. Consulting with an investment counsellor does not mean, however, that you must take all his advice or that you should neglect to investigate the securities you finally decide to buy, because you feel that he knows more than you do.

In buying investments, timing is of the utmost importance. Timing may refer to the market as a whole or to the industry you have chosen or to the company's investments you have picked. There is an old wheeze to the effect that making money on investments is easy, "all you have to do is buy at the low and sell at the high." The natural reply is: "True, if we only knew when." You can at least attempt to approximate that knowledge. If, when you are about to buy, the market, or the industry, or the company's stock is at or near the highest level it has reached for years, then the chances are excellent that a decline

is more probable than a further rise. We told you about the *Standard's Listed Stock Reports*. They have little charts at the top of each which are helpful from the standpoint of timing. They show the trend of the market over recent years, the trend of the industry, and of the company within that industry. A study of these three lines can be very meaningful. If, for example, all three are rising and higher than ever before, beware. It is obvious that you are not purchasing at an attractive level. On the reverse side of these Stock Reports are the actual statistics on earnings, dividends, and price range for ten years or more. We urge you to look at these. They may suggest an explanation for the price behavior of the stock shown on the chart and further justify its present position in relation to past performance. When you have finally decided to buy, hesitate no longer; buy promptly. If you wait, you may have the painful experience of seeing the investment go up and your carefully calculated gain lost so far as you are concerned.

When you are ready to place your order for stocks or bonds, do not be disturbed because others do not agree with your selection. Remember you are buying on a market. Someone else is selling the investment you are buying, either because he needs the money or because he thinks that investment is not as good as some other. You think it is the best selection for your purpose. Such differences of opinion make the market. If everyone thought the same about any

1948		Stock			Sales in 100s	Open	High	Low	Last	Net Change
High	Low									
58	50½	Gen. Motors	3	xd	22	56¼	56½	56	56½	-2¼

investment, there would be no market.

When you place your order, you may tell the broker to buy at whatever price it is necessary to pay—that is, “at the market”—or you may set a price and wait for some seller to accept it. In general, the former procedure is recommended, especially if the investment is one that is actively traded. Once you have bought, the broker or banker expects you to pay promptly. He will then register the investment in your name, if it is a stock, and send in your address so that dividends and earning statements will be sent directly to you.

You should keep a careful record of your investment transactions. Ask your broker for a securities record book. He probably hands it out as an advertisement and will be glad to show you how to use it. Record in this the serial number on your bond or stock certificate, the day you bought it, how much you paid for it, and through whom you bought it. Plan to keep a record in this book of the interest or dividends you receive. Meanwhile, put your stock certificate or bond in a safety deposit box or some other safe place.

How to Watch Your Securities

At first you will probably look at the financial page every day to see the latest market quotation on your stocks and bonds. It is fun, like

watching the day-to-day standings of your favorite big league team. Since you will undoubtedly do this, you might as well understand how to read the market quotations that ordinarily appear in a newspaper. Let us interpret a typical common stock quotation for you. (See above.) The first two figures indicate highest and lowest sales prices for 100 shares or more for the year. The “3” after General Motors means that each share of that stock paid \$3 in dividends the past year. The “xd” stands for “ex-dividend,” and means that if you buy it now, the former owner, not you, will receive the impending quarterly dividend payment. The next four quotations are plain enough; each refers to the sale of at least 100 shares. Net change of minus 2¼ means that the last sale today was at the rate of \$2.25 less per share than the last sale yesterday. For an explanation of other little signs, consult the footnotes at the end of the newspaper’s stock quotation list. After a while the fun of watching will wear off, as it should, and you will look only occasionally to see what your securities are selling for. You should still look at least once a week. You should be interested in the month-to-month and year-to-year behavior of your investments, not their day-to-day fluctuations. If the investment is sound and pays what you expect, you can largely forget these daily ups and downs.

You will receive quarterly reports and other leaflets from all your companies. You will be interested in how their earnings per share this year compare with those of last year, in their expansion programs, if any, and in any securities senior to yours they may contemplate issuing. Once a year your company will send you a proxy to fill out and return. This simply means that the present management want you to let them vote your stock. It is by this device that they perpetuate their control even though in many cases they own only a small per cent of the total stock. When you analyze the situation, you have only three choices: (1) sign and let them vote it as they wish; (2) throw the proxy away, and thus not vote against them; (3) journey to the stockholders' meeting, where you can have no influence anyway. Your helplessness may annoy you. Forget it. You are only discovering that a small stockholder is not really much of an owner of the company after all. If you approve the policies of the management, so far as you are aware of them, do them the courtesy of signing the proxy and sending it in; if you disapprove, the best thing to do is sell the stock.

When your dividend checks come in, cash them promptly and enter the date and amount in the record book your broker gave you. You will need this record for income tax purposes. If you have a bond or debenture, you will have to clip the coupon on the due date. Your bank will cash it for you.

When You Should Sell Your Investments

You have been told repeatedly that you should investigate before you invest. Likewise, you should watch for news of your companies and of general economic changes after you have invested. Read the financial section of your newspaper, perhaps a financial journal, and the quarterly and annual statements of your companies. Consult new issues of *Standard's Listed Stock Reports*. Ask the National City Bank of New York to send you its monthly letter on economic conditions. It is excellent and it is free. Do not sit back and assume that your job is done, now that you have invested. Keep posted on current developments. You will not want to make many changes, but changing conditions in the economy or in your company will sometimes indicate that you should make some shifts in your investments.

You will discover very early that it was far easier to buy than it is to sell. If your stock or bond has risen, you are so pleased that you will not think of selling. Yet the time to sell is after your stock has had a substantial rise. An old saying goes that "No one ever got poor taking a profit." After all, you cannot hope to know when it has reached its peak and then have the wisdom to sell it at just that point. The person who does so is just lucky, and such luck does not often repeat itself. The person who makes some profit on his stocks is the one who sells too soon; in other words, he is not greedy for all the increase.

He sells after a substantial rise and is happy over his gains rather than unhappy over any further rise.

On the other hand, if your security goes down, you must decide whether to sell, accept some loss, and save the rest of your money, or hold on because the company is good and you think the security will recover. You will do best to let your judgment of the company's and the industry's soundness guide you and try to shut out any emotion emanating from the stock market.

All this suggests that you may be continually buying and selling. While occasional purchases and sales may be desirable, you should avoid frequent shifts. Presumably you are an investor, not a speculator. If you shift often, it becomes costly and your losses may mount. If you shift, you may lose dividend payments in the process. Every time you shift, you have to make two right decisions instead of one

as when you first bought; the risk of wrong decision is thus multiplied. In short, choose carefully at the outset and thus avoid most of the necessity for shifting.

Conclusion

In conclusion we can do no better than to quote the investment advice of a man who has been eminently successful as an investor, who is famous the country over for his common sense, and who has probably given America more good advice in the last generation than any other citizen. We refer to Bernard Baruch. He sums up a successful investment policy under four headings:

1. Get all the facts.
2. Exercise patience in studying them.
3. Use imagination in dealing with them.
4. Be willing to act on your conclusions boldly and at once.

State Veterans' Bonuses. State bonuses being paid this calendar year to veterans of World War II will augment the flow of personal income by a total of perhaps 750 million dollars. This amount is more than double last year's payments of 350 million dollars and almost double the total State bonus payments made over a period of several years to veterans of World War I. The larger part of the payments in calendar 1947 was in the second half of the year. Thus the increase in the rate of payments from the first to the second half of the year was larger than the further increase expected in the first half of 1948.

Almost all of the 1948 payments will be made by the states of Illinois and New York whose programs are now in operation, and by Ohio where disbursements are expected to begin about mid-year. The earlier programs comprised those of five New England states and the State of Michigan. — *From Survey of Current Business, April, 1948.*

Synthetic Liquid Fuels

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THE Third World War is undeclared as yet; the odds seem to be heavily against such a war in the near future. However, the tension is sufficiently great and incidents frequent enough that anything except preparedness by the United States would be foolhardy. Even a cursory study of the history of World War II, particularly the methods of waging it and the means of stopping it, indicates clearly that no shooting war can be waged without adequate means of transportation on land, on water, and by air. The most modern and best designed transportation equipment is totally valueless unless the proper fuels are available to speed such equipment to its destination and return.

The very nature of World War II made necessary the unprecedented development of the science of Logistics, which may be defined simply as "the method by which the right amount of men and materials is located at the right place and at the right time." No country can hope to win a shooting war unless it excels in Logistics, and no country can excel in this field unless it is better prepared than its adversary in the transportation of equipment and has the fuels necessary to operate this equipment at the highest efficiency. The time required for the Allies to overcome

Germany was a function of their ability to cut German transportation lines, immobilize enemy equipment, and reduce German fuel supplies below the quantity and quality necessary for the efficient use of the German transportation facilities.

Thus, it appears that the greatest problem facing the United States today in preparing for a possible Third World War is that of the assurance of an adequate fuel supply, as to both quality and quantity. The total fuel reserves of this country are enormous and far exceed in quantity any demand that a Third World War would put upon this nation. However, these reserves do not occur in the form necessary for use in most modern transportation equipment—internal combustion engines used in airplanes, motor cars and trucks, Diesel engines, and oil-burning steamships. Estimates by the Federal agencies best qualified, and knowledge of the extent of fuel reserves, indicate that 98.8 per cent of the known United States fuel reserves consists of the solid fuels which are known as coal and lignite, 0.8 per cent of these reserves is in the form of oil shale, and that the remaining 0.4 per cent is divided equally between petroleum and natural gas deposits.

The best-known source of supply and the easiest to convert to the

desired liquid fuels is petroleum. However, with reserves estimated at 21 billion barrels, and present annual consumption just over 2 billion barrels and expected to rise 40 per cent by 1955, there is a possibility that the petroleum industry will not be able to satisfy even peacetime demands from production within the continental United States. On the other hand, American oil companies own and control sufficient petroleum in the Middle East and other parts of the world to satisfy practically everyone's needs for an indefinite period. The world political situation, however, is not stable enough for the United States to gamble on this source for an adequate supply of liquid fuels in case of another World War. It is not yet forgotten that the Big and Little Inch pipe lines were made necessary because enemy submarines were able to sink so many coastwise tankers on the route from Texas to the eastern seaboard of the United States.

Facing these facts, Secretary of Defense Forrestal and Secretary of the Interior Krug have recommended to Congress the immediate start of a five- to ten-year program to establish a synthetic oil industry in the United States.

Much technical information is already available for such a program. For more than fifteen years laboratory and pilot-plant research along this line has been pursued by some of the larger oil companies and also by the United States Bureau of Mines. Oil can be made from almost any material having a high carbon content, but most of

the synthetic liquid fuel will be made from coal, shale, and natural gas.

Natural gas and petroleum differ chemically from wood, lignite, and coal, in that they have a higher percentage of hydrogen and are practically devoid of oxygen, as illustrated in Table 1. Likewise, the processed fuels contain from 12 to 15 per cent of hydrogen and have only very small amounts of oxygen.

Processes

Conversion of solid fuel into a desired liquid or gaseous fuel consists in the addition of hydrogen (hydrogenation) and simultaneous removal of oxygen along with change in size and structure of the chemical molecules. Two general processes have been developed:

(1) *The Bergius Process*—direct hydrogenation. Coal is ground to below 40 mesh, mixed with oil to form a stiff paste, and treated with hydrogen gas in the presence of a catalyst at 700 atmospheres pressure and a temperature of about 480° C. The reaction products are released from the pressure chamber, cooled, and separated, the unreacted and partially hydrogenated material being recycled. Operating conditions may be so controlled that the principal product will be regular gasoline, aviation gasoline, or fuel oil. Phenols, including the cresols and xylenols, may be recovered in amounts equal to 5 per cent of the weight of the dry, ash-free coal.

(2) *The Fischer-Tropsch Synthesis*—indirect hydrogenation. In

TABLE 1.—APPROXIMATE COMPOSITION OF VARIOUS FUELS
(Dry Mineral—Matter-Free Basis)

Fuel	Percentage of		
	Carbon	Hydrogen	Oxygen
A. Natural Occurring Fuels			
Wood (oak or pine).....	50	6	44
Lignite.....	71	4.5	22
Coal, bituminous.....	88-76	5-6	5-16
Coal, anthracite.....	94	3	2
Methane.....	75	25	...
Natural gas (mainly methane).....	82-77	13-22	...
Petroleum, crude.....	86-84	12-14	...
B. Processed Fuels			
Gasoline.....	84	15.5	...
Kerosene.....	84	15.5	...
Fuel oil.....	85	13-14	1
Lubricating oil.....	88-85	12-15	...
Diesel oil.....	85	14	...

this case the solid coal is converted as completely as practicable into a mixture of carbon monoxide and hydrogen (known as synthesis gas), either by burning in air in the presence of steam or by the use of oxygen and steam. Treatment of the synthesis gas at one or ten atmospheres pressure and a temperature of 180-200° C. results in the production of regular gasoline of relatively low octane number, fuel oils, waxes, and a large number of organic chemicals of industrial importance. Operating conditions may be adjusted to control to a limited extent the type of products obtained.

Synthesis gas may be produced also from natural gas, and this source has proved to be the more attractive for immediate exploitation by a number of the oil companies. Thus, the first synthetic

liquid fuel to be produced in this country will be made from natural gas by a modification of the Fischer-Tropsch Synthesis.

Carthage Hydrocol, Inc., organized by the joint efforts of eight companies, is building a gasoline-from-natural-gas plant near Brownsville, Texas. The plant is expected to produce 7,000 barrels of liquid fuels and 150,000 pounds of chemicals a day. The Standard Oil Company of Indiana, through one of its subsidiaries, is building a plant of like capacity in the Hugoton Natural Gas Field in Kansas, at an estimated cost of \$32 millions as compared with \$21 millions for the Brownsville plant.

Although at present natural gas seems to be the cheapest and quickest source of synthetic gasoline, it is thoroughly understood that this

is a relatively temporary procedure. The known natural gas reserves are limited to 30 to 35 years' production at the present rate of 5 trillion cubic feet a year. Therefore, it is not surprising that some of the same large oil companies that are interested in the production of gasoline from natural gas are also very active in research on the production of synthetic fuels from coal by the Fischer-Tropsch Synthesis.

The Standard Oil Company of New Jersey and the Pittsburgh Consolidation Coal Company of Pittsburgh have joined in the construction of a coal-to-oil pilot plant at Library, Pennsylvania. As soon as results from the pilot plant can justify the construction of a full-scale plant, it will be built. The cost of such a plant is now estimated at \$120 millions.

Government Research

The Synthetic Liquid Fuels Act of 1944 allocated, under certain restrictions, \$30 millions to the United States Bureau of Mines for operation of a five-year program of laboratory and pilot-plant investigations on the technical and economic aspects of the production of synthetic fuels from coal, lignite, natural gas, and oil shale. Work on this program has proceeded rapidly. On March 15, 1948, President Truman signed Public Law 443 (H.R. 2161) authorizing an additional \$30 millions for continuing this program for another three years ending April, 1952.

A \$2,000,000 demonstration plant for the production of liquid fuel from oil shale was completed and

put into operation at Rifle, Colorado, in May, 1947. The reserves of oil from shale in this section of Western Colorado and adjacent territory are estimated at 200 billion barrels. Total United States deposits, estimated at 300 billion barrels, would be sufficient to satisfy in quantity, though possibly not in quality, United States demands for 150 years at the 1946-1947 rate of consumption, or for more than a hundred years at the expected 1955 demand of 7 million barrels per day.

Large-scale equipment is being used to determine mining and preparation costs. Shale crushed to 3.5 inch size is retorted to produce a crude which closely approximates No. 6 petroleum fuel. The best average monthly direct cost reported to date (March, 1948) is 9.6 cents a gallon of crude. However, the same source reports that it is believed that the cost will drop to 5 cents a gallon if two retorts are operated continuously. Crude shale oil is reported to be of low quality and difficult to refine into high-grade fuels.

Also, in May, 1947, a new building to house laboratories and offices for oil shale research and development was completed adjacent to the campus of the University of Wyoming at Laramie. In addition to research on problems of the retort process, a second process for extracting oil from shale is being studied—extraction of the oil by solvent leaching at an elevated temperature.

For several years research and development work on the produc-

tion of synthetic fuels has been carried on by the Bureau of Mines station at Pittsburgh; last year this work was moved to new quarters at Bruceton, Pennsylvania. This division has been investigating the production of hydrogen (since the cost of high pressure hydrogen is approximately half of the total cost of producing fuel oil); the separation of tar acids which are the major valuable by-products of coal hydrogenation; the development of new and improved catalysts; and an experimental unit for gasifying powdered coal with oxygen and steam.

A synthesis gas production division has been established in laboratories at Morgantown, West Virginia. This group is studying two processes for the production of synthesis gas from coal. One of these processes is for the gasification of pulverized coal entrained in superheated steam containing oxygen. The other process under study is that of gasification of coal in place underground. A preliminary experiment along this line was conducted near Gorgas, Alabama, in early 1947. Results were considered sufficiently encouraging to justify another large-scale experiment, which is now being planned.

Recently the University of North Dakota at Grand Forks donated 13 acres of its campus to the Bureau of Mines to be used as a site for the location of a new lignite research laboratory to cost \$750,000. The Bureau's work on the production of carbon monoxide and hydrogen from lignite is to be continued in the new laboratory.

Two processes for the production of liquid fuels from coal are to be tried by the Coal-to-Oil Demonstration Branch of the Bureau of Mines at the site of the Louisiana, Missouri, Ordnance Plant, which produced ammonia during World War II.

A \$7,000,000 coal-to-oil demonstration plant with a capacity of 200 barrels of gasoline a day produced by direct hydrogenation of coal (Bergius Process) will be completed and put in operation during 1948.

Also a contract was let in March to the Koppers Company for the construction of a \$4.4 million demonstration plant with 80 barrels a day capacity for production of liquid fuels by indirect hydrogenation of coal (Fischer-Tropsch Synthesis), to be constructed at Louisiana, Missouri, adjacent to the Bergius plant. This plant also is expected to go into operation before the end of 1948.

Secretary Krug's Program

In his annual report to Congress Secretary Krug proposed a ten-year program for the establishment of a synthetic liquid fuels industry in this country. The goal set is a production capacity of two million barrels of oil a day, or approximately 40 per cent of the average daily production of petroleum in 1947. It is recommended that this program be developed along four major lines of production, each to produce 500,000 barrels of oil a day:

- (1) From coal by direct hydrogenation — Bergius Process.

- (2) From coal by indirect hydrogenation — Fischer-Tropsch Synthesis.
- (3) From natural gas — Fischer-Tropsch Synthesis.
- (4) From shale oil.

As previously noted, demonstration plants to determine engineering and operating details for the first two processes are now under construction at Louisiana, Missouri, and should be in operation before the end of 1948.

The Bureau of Mines demonstration plant at Rifle, Colorado, is already in operation. The Union Oil Company of California also is reported to be putting up a plant to process about 50 tons of shale a day. Based on the estimate of 30 gallons of oil per ton of shale, this unit would have a capacity of about 35 barrels of oil a day.

According to Dr. W. C. Schroeder, Chief of the Synthetic Liquid Fuels Program of the Bureau of Mines, the production of oil from natural gas will be left to the large oil companies, as they already have solved many of the technical problems and are in the best position to develop this phase of the program.

P. C. Keith, President of Hydrocarbon Research, Inc., reports that the natural gas conversion plant of Carthage Hydrocol at Brownsville, Texas, to produce 7,000 barrels of oil a day, is under construction and planned for completion in May, 1949. The plans for the plant of the Stanolind Oil and Gas Co. in the Hugoton field in Kansas are still in the drafting stage.

As the next step toward estab-

lishing a synthetic fuels industry it is expected that Secretary Krug will ask Congress for an appropriation (tentatively set at \$400 millions) for the construction of three commercial units, each of 10,000 barrels daily capacity. Two of these would start from coal, one by direct hydrogenation (Bergius Process) and the other by the indirect Fischer-Tropsch Synthesis, and the third would produce oil from shale.

It is no surprise to find that considerable information is available in regard to the requirements of each of these proposed plants for raw materials, equipment, and plant site.

The first hydrogenation process to be operated on a commercial scale was developed by Bergius in Germany. This plant, located at Leuna, was designed to use brown coal and was started in 1927. Early difficulties in operating the process caused a switch in source of raw materials from brown coal to brown coal tar. However, by 1931 these difficulties had been overcome and the process was operated with brown coal. By 1937 Germany had erected her first hydrogenation plant for the use of bituminous coal. This plant was similar in design to one which had been erected by the English at Billingham and was operated by them from 1935 on. This type of hydrogenation plant was the most important of the German synthetic fuel processes, as it provided practically the entire aviation fuel requirements of Germany in World War II.

The first commercial Fischer-Tropsch plant was put into opera-

tion in Germany in 1936. Though this type of plant produced no aviation gas and provided only 14 per cent of the total German production of oil from coal in World War II, nevertheless it contributed greatly to the production of Diesel oil, waxes, and chemicals for the German war machine. The German production units were small, because they had not solved the problem of heat dissipation. That problem has been solved in this country since the war.

Thus we now have available both German and English industrial experience to guide the research and pilot-plant work planned. Most of the following information in regard to industrial plant requirements for direct hydrogenation of coal was furnished to the writer by Dr. L. L. Hirst, Chief, Coal-to-Oil Demonstration Plants, United States Bureau of Mines, Louisiana, Missouri, who has contributed greatly to the research and development work of the Bureau of Mines in this field for many years.

The optimum size of plant for direct hydrogenation of coal will probably be 30,000 barrels capacity a day—not 10,000—largely because of labor requirements. Because larger units of process equipment can be used to advantage in a larger plant, the labor requirements for a 30,000 barrel a day unit would not greatly exceed those for a 10,000 barrel a day plant. Consequently, the figures given here are based on requirements for a plant producing 30,000 barrels of liquid fuels a day.

If operated for the production of regular gasoline, the daily yield of

products is estimated at: 21,604 barrels of gasoline of 78 to 79 octane rating; 5,126 barrels of commercial propane; and 2,040 barrels of butane containing 75 per cent isobutane. (Mixtures of propane and butane in various proportions are sold as bottle gas; mixtures of butane and isobutane may be reformed to produce isooctane and aviation gas stock).

When operated for aviation gasoline, the daily yields would be: 11,000 barrels of aviation gasoline of 100-130 octane grade; 12,250 barrels of aviation base of 78 to 79 octane rating without lead; and 3,720 barrels of regular gasoline.

Labor Requirements

For each shift, 350 men would be required. The total number working in a plant with the assumed capacity would be approximately five times that number, or 1,600 to 1,800 employees, 15 per cent of whom would be classified as supervisory and technical personnel.

Coal Requirements

The coal actually processed is one half of the total plant requirement. The other half is used in the manufacture of hydrogen and as boiler fuel. Coal to be used in the liquefaction should preferably have not more than 3 per cent ash. A cleaning plant will be a necessity, and in many plants the high ash portion will be used as boiler fuel. The low ash portion will be pulverized to —60 mesh, with a minimum size of —200 mesh, in a ball mill; at the same time it will be dried to 0.9 per cent moisture content by heat-

ing to 300° F. with combustion gases.

Each ton of processed coal yields four barrels of liquid fuels. However, as only half of the coal is processed, the net yield is two barrels of liquid fuel for each ton of coal. Thus, a 30,000 barrel a day plant would require 15,000 tons of coal a day, or 5.5 million tons a year. As the life of such a plant is estimated at 15 to 20 years, it is only logical that it be located as near as possible to a coal deposit sufficiently large to meet the 20-year requirements—110 million tons—a seam of coal 5.5 feet in thickness and 20 square miles in area.

Secretary Krug's program of 500,000 barrels a day by direct hydrogenation would make necessary 17 such plants. Total annual coal requirements for these plants would therefore be approximately 94 million tons.

As the Secretary's program calls for an additional 500,000 barrels of liquid fuels a day by indirect hydrogenation of coal—Fischer-Tropsch Synthesis—those requirements must be considered also. The synthesis gas is to be made at the Louisiana, Missouri, demonstration plant by a modification of the German Koppers process. The coal should be clean and the softening temperature of the ash should be above 2200° F. About 50 per cent of the coal is used in evaporating water. The coal requirements in this case will be as much or a little more than those for direct hydrogenation.

Thus the program to produce

500,000 barrels of oil by direct hydrogenation of coal and a similar amount by indirect hydrogenation will require about 200 million tons of coal per year—an amount equal to a third of our present national production. Assuming that 400,000 miners are needed to obtain our present annual production, an additional 135,000 miners would be required. These figures on coal requirements for the Krug program do not include any coal which may be used for power generation in the production of oil from natural gas or from shale.

Natural Gas Requirements

On the basis of 12,000 cubic feet of gas being required to produce one barrel of oil, a 10,000 barrel a day plant would require 120 million cubic feet of natural gas each day. Fifty such plants would be necessary to produce the 500,000 barrels of oil projected in the Krug program. The natural gas demand would then become six billion cubic feet a day, or 2.2 trillion cubic feet a year. That figure is more than 40 per cent of our present annual production.

Water Requirements

While it is desirable to locate a hydrogenation plant as close as possible to an adequate coal supply, it is absolutely necessary that a sufficient quantity of clean water free from suspended solids be available.

For each ton of coal $8\frac{1}{2}$ tons of make-up water is required. By "make-up water" is meant the amount of fresh water from the

source of supply which must be added to the plant system. For instance, in a plant producing 30,000 barrels of oil a day 360,000 gallons of water will be circulated each minute, but only 1/18 of this amount, or 20,000 gallons per minute, will have to be added to the system. This make-up water would be utilized as follows:

	GPM
Evaporation in induced draft cooling towers.....	12,150
Blow-down from cooling system.....	3,625
Boiler make-up for hydrogen manufacture	1,000
Boiler make-up for boiler blow-down and losses.....	500
High-pressure injection water.....	150
Sanitary waste requirements.....	575
Miscellaneous (10%).....	2,000
TOTAL.....	20,000

As two-thirds of the make-up water is evaporated, 6,000 to 7,000 GPM would be discharged as plant effluent. Whether or not the effluent will require treatment before discharge from the plant will be a local problem.

According to Dr. Hirst and his co-workers, if the water supply were plentiful it would be desirable to use 30,000 GPM of make-up water, in which case the additional 10,000 GPM would increase the effluent to that extent.

As the water used is largely a function of the heat generated in the process, it naturally follows that a plant of one-third the assumed size—10,000 barrels of oil a day capacity—would use approximately a third of the water required by the larger plant.

Since the over-all plant efficiency is estimated to be about the same for direct or indirect hydrogenation of coal, theoretically the water re-

quirements should be the same. It is believed, however, that the Fischer-Tropsch process will require 50 per cent more make-up water than a Bergius plant of the same size. Thus a 30,000 barrel a day Fischer-Tropsch plant would require 30,000 GPM of water instead of the 20,000 GPM of make-up water needed for a Bergius plant of the same capacity.

Steel Requirements

In the *Oil and Gas Journal* for February 5, 1948, Bruce K. Brown, President of the Pan American Petroleum Transportation Company, is credited with the following estimates of steel requirements for the production of one ton of oil a day from various sources: To produce a ton of oil a day from a new field in a new refinery in the United States requires 26 tons of steel, but it would require 34 tons of steel per daily ton of oil from shale, 49 tons from natural gas, and 70 tons from coal.

Thus Secretary Krug's program would require 16 million tons of steel—10 million tons for the two processes from coal, 3.5 million tons for the oil from natural gas plants, and 2.5 millions for the oil from shale. These figures do not include steel for production of raw materials. Also, the figures do not distinguish among kinds of steel. The direct hydrogenation of coal takes place in reactors operating under 10,000 pounds pressure per square inch and at a temperature of 480° C., whereas the indirect method—Fischer-Tropsch—operates at a

maximum pressure of 150 pounds per square inch and at a temperature of 180 to 200° C.

In speaking of high-pressure reactors, it is interesting to note that *Industrial and Engineering Chemistry* for April, 1948, in an editorial report states that the total large-capacity forging facilities in this country can turn out in one year only 50 full-size high-pressure reactors — just about enough to equip one plant producing 30,000 barrels of oil a day.

Costs

Direct costs are used to evaluate and compare on an empirical basis the sum total of raw materials and labor entering into a unit quantity of finished product. These costs are accurate only on the basis of assumptions made. Identical plants built in different parts of the country will not show identical costs. Wages differ from one area to another; transportation charges for equipment and raw materials vary in accordance with distances and routes; and the relation between supply and demand of both labor and materials has a decided effect on the cost to the purchaser.

Bearing such uncertainties in mind, it is not difficult to understand why the estimated costs of synthetic fuels differ greatly from one estimator to another. This does not mean necessarily that one estimator is less careful or less well-informed than another; it may mean only that the two estimators made different assumptions, had different figures and information

available, or used different formulas in making their calculations.

For instance, what is the direct refinery cost of motor gasoline today? In 1944 the OPA price was 4.75 cents a gallon. At present, the estimated cost is from 7 to 9 cents per gallon, with the narrow-range estimates around $8\frac{1}{4}$ to $8\frac{1}{2}$ cents. In contrast, one authority states that with equipment newly constructed and operated for maximum yield of gasoline the cost would be 14 cents a gallon. It is very difficult to set up a sound amortization schedule under present conditions.

Motor gasoline produced by direct hydrogenation of coal in a commercial plant of 30,000 barrels a day capacity is estimated by the Bureau of Mines to have a direct plant cost of 16.9 cents a gallon. This is on the basis of crediting butane and propane at 8.5 cents a gallon, taking no credit for phenols, realizing no return on investment, and amortizing the plant over a 15-year period. A 3 per cent return on investment would add $2\frac{1}{2}$ to 3 cents to the cost of each gallon. By crediting phenols at 10 cents a pound, and assuming no return on the investment, the cost of regular gasoline would be about the same as that of gasoline from petroleum.

Assuming a 3 per cent return on investment, taking phenol credit, and using a 15-year amortization period, the Bureau of Mines estimates a direct plant cost of 18.65 cents a gallon for aviation gasoline.

Also, assuming a 10,000 barrel a day plant built and operated principally for the production of fuel

oil, the cost would be 10 to 11 cents a gallon.

Assuming natural gas to be available at 10 cents per thousand cubic feet, R. W. Krebs, of the Esso Laboratories (Standard Oil of New Jersey), estimates the cost of gasoline from natural gas at 13 cents a gallon compared with the above-mentioned 14 cents a gallon for gasoline obtained from petroleum by new equipment operated for maximum yields of gasoline. He states that a similarly estimated price for gasoline from coal might be 16 to 17 cents a gallon, and that from shale might cost 16 cents.

In many of the calculations made on the use of natural gas, the cost is estimated at 5 cents per thousand cubic feet. Mr. Krebs assumed a cost of 10 cents per thousand cubic feet. However, it seems only fair to ask what the cost of natural gas would become if the annual consumption for liquid fuels should reach more than 2 trillion cubic feet—about 40 per cent of our present annual production.

Plant Costs

The Bureau of Mines estimates that a 30,000 barrel a day Bergius plant in Illinois would cost \$350 millions—about \$10,000 for each barrel a day capacity. The cost of seventeen such plants over the country would approximate \$5.5 billions. Similarly the cost of a 10,000 barrel a day plant for fuel oil would be about \$6,000 per barrel per day capacity.

Although the optimum size for a

plant to produce oil by indirect hydrogenation of coal (Fischer-Tropsch Synthesis) is a capacity of 10,000 barrels of oil a day, no final estimates are yet available from the Bureau of Mines on the costs of these plants, 50 of which would be required in the Krug program.

Mr. Krebs is reported to have given the following estimates for plant costs of synthetic fuels: "The investment per barrel per day of oil products capacity for crude oil production, transportation to consuming area and refining is about \$4,300 for maximum distillate yield and \$6,500 for maximum gasoline yield, and for oil synthesis from natural gas \$7,400 and \$8,200 on the same basis. For synthesis starting with coal, \$7,600 and \$8,200 is estimated and from shale \$6,100 and \$8,400. With coal and shale product transportation is not included which may be required in areas west of the Mississippi. High housing costs, also, must be added for such a location.

"It is evident from these figures, that construction costs play a large part in determining the price of synthetic gasoline. Despite these high costs, however, the average motorist need feel little concern over the future supply of gasoline for his automobile, for even at the present stage of development of the gasoline-from-coal process, estimates show that it will cost him only 10 to 15 cents per day more to operate his car on gasoline from coal than he now pays for petroleum gasoline."

Comments

There appears to be no doubt that the world reserves of petroleum are adequate to supply all needs for an indefinite period. The United States, with 31 per cent of the proven reserves, accounts for 63 per cent of world production. In addition, the large oil companies of this country own or control a sizable portion of the other major oil deposits, particularly those in Saudi Arabia and other countries in the Near East. Were it not for the specter of war again rearing its ugly head on the horizon, a synthetic liquid fuels program would not be projected by the Federal government at the present time but would develop slowly and naturally in the laboratories and plants of the large oil and coal companies. The oil companies have a tremendous stake in any old or new industry which may produce liquid fuels. As over 98 per cent of our known fuel resources are available in the form of the solid fuels, coal and lignite, these resources are the logical raw materials for liquid fuels as petroleum reserves dwindle. Thus cooperation between large oil companies and large coal companies is the logical starting-point in developing a synthetic fuels industry on a sound basis and with the least dislocation of related industries.

Particular reference should be made here to the chemicals which will be produced as by-products in the Fischer-Tropsch process plants that produce oil from natural gas or coal. Alcohols, aldehydes, ketones, and acids now produced by the synthetic organic chemical in-

dustry will be produced in many times the quantity now required. One estimate shows that 10 plants of 7,000 barrels of oil capacity a day—such as the Carthage Hydrocol Plant at Brownsville, Texas—would produce an average of 68 per cent of the corresponding products now produced by the present organic chemical industry of this country, varying from 28 per cent for acetaldehyde to 87 per cent of the present acetic acid production. On the same basis Secretary Krug's plan would produce from natural gas alone seven times that amount of organic chemicals, or on the average $4\frac{3}{4}$ times the average yield of these chemicals from the present organic chemical industry. In addition, the Krug program would entail the production of a similar quantity of these same chemicals from the Fischer-Tropsch plants producing oil from coal. Fortunately, so large a quantity of chemicals cannot be thrown on the market in a short space of time.

It is well known that there is a considerably greater demand for natural gas for home and industrial use than can now be met. Were 2 trillion cubic feet of natural gas allocated to liquid fuel production, the question of filling the needs of established markets for natural gas would have to be answered. Also, what justification is there for spending raw materials and labor on a process to produce a liquid fuel from natural gas which results in a loss of a large proportion of the heating value of the raw material and yields a product—fuel oil—

which is more costly and not so satisfactory for the end use of house heating?

The nature of the operations involved in recovering and refining petroleum and producing fuel oil, aviation gasoline, and a host of other products gives this industry much more of the necessary "know-how" to produce synthetic fuels from natural gas than is available to any other industry or to government agencies. The Bureau of Mines recognizes this fact and has wisely left this phase of the problem to the oil industry.

The only real difference between the production of oil from natural gas and oil from coal by the Fischer-Tropsch Synthesis is the method of producing the Synthesis Gas (carbon monoxide and hydrogen). One of the major questions in either case appears to be that of a cheap method for the production of oxygen. Again the major oil and coal companies appear to be in a strategic position to design and operate plants for oil from coal by indirect synthesis (Fischer-Tropsch).

Apparently some of the oil companies, after years of laboratory and small-scale experimentation, have begun to favor the Fischer-Tropsch process over the Bergius process for production of oil from coal, in spite of, or because of, all the information available on German and British experience.

Although the recovery of oil from shale is a relatively simple process, the tonnages of materials to be handled are enormous—10

tons of shale per ton of oil. Methods for economical handling and processing will necessarily have to be developed, as the principal shale deposits lie in areas remote from the larger markets. Transportation methods and costs will have to receive due consideration. Already, Standard Oil of California is experimenting with pipe lines for oil from shale. Methods of refining shale oil are still in the experimental stage.

It is to be sincerely hoped that there will be no unwary rush into this gigantic program which is many times the size of the synthetic rubber program undertaken and successfully fulfilled during World War II. The Synthetic Fuels Program is too huge to be put into operation overnight—or over a year's time. It must be done over a period of years as required to amplify dwindling supplies of fuels from petroleum; otherwise, many appercarts and markets will be upset and disorganized. It appears logical that one demonstration plant of commercial size for each of the major processes be built and operated to produce liquid fuels from shale and from coal by Bergius and Fischer-Tropsch procedures. The greatest progress would undoubtedly come by cooperation between government and industry—with industry operating the commercial plants and government aiding in the financing when necessary.

As the Krug plan calls for an expenditure of 9 or 10 billion dollars and requires 16 million tons of steel, it evidently will require some

years to put into operation. Also it is exceedingly doubtful whether the funds suggested for this program could be raised from private capital. Only the specter of war and a policy of national preparedness can justify consideration of such a program. Many of the top administrators in the oil industry have stated their belief in the ability of industry to satisfy the nation's and

the world's requirements for liquid fuels with a fraction of the steel and expenditures demanded by the Krug plan. Should not the ideas of these top-flight executives be given due weight in the shaping of any synthetic liquid fuels program? In any case, however, the prices of gasoline and fuel oil to the consumer are due to increase.

Economic Report of the President. President Truman, in his Economic Report, pointed to the high level of most economic activities in 1947 and the peacetime record established in a number of them. Civilian employment passed the 60-million mark in June and averaged about 58 million for the year; unemployment reached the practical minimum. Output per man-hour was only slightly higher than in 1946, but production of goods was about 7 per cent above 1946 and 76 per cent above the 1935-39 average. Consumer income, after taxes, reached a new high in the last quarter of 1947 at the annual per capita rate of \$1,264. . . . Almost twice as many housing units were completed in 1947 as in the previous year. Exports of goods and services reached an all-time high annual rate of 20 billion dollars. Imports continued to lag behind exports, resulting in an export surplus of 11 billion dollars. After government expenditures of 41.3 billion dollars the cash receipts surplus was 5.6 billion dollars.—From *Monthly Labor Review*, March, 1948.

Home Building. Since V-J Day the question of building a home has involved a sort of tug-of-war between rapidly mounting costs and the acute shortage of living-space. Thus far the latter has exerted the stronger pull. In spite of costs far above the prewar level, more new dwelling units were started in 1947 than in any other year since 1925. . . . As for future prospects, the need for more living-space remains a powerful force. However, as the shortage begins to ease slightly, the factor of building costs is assuming greater importance.—From *Business Bulletin*, The Cleveland Trust Company, April 15, 1948.

Trends in Railroad Fuel

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LESS than twelve years ago the first passenger Diesel locomotive made its appearance as a competitor of the steam engine, and not until 1939 was the first main-line Diesel freight locomotive placed in service. Yet, in these post-war years more than 90 per cent of the new locomotives ordered are Diesels. Much interest is being shown in this changing trend in locomotive power and the attendant shifts in demand upon railroad fuels.

This current shift from the picturesque but somewhat obsolescent steam engine to the ultra-modern Diesel locomotive has aroused interest and concern, not because the proportion of Diesels in service is large as yet, but rather because their increased use parallels a rapid decline in the number of steam locomotives. Although the railroads use only 13 per cent of the commercial Diesel horsepower in the United States, they burn nearly one-fourth of all Diesel fuel consumed in this country.

Since a Diesel locomotive costs fully twice as much as a steam locomotive capable of hauling the same load at practically the same speed, why are the railroads finding Diesels a better investment? The answer lies in the Diesel's high efficiency. In the process of fuel combustion, which releases energy in the form of heat, the conventional

steam engine is about 7 per cent efficient, the steam turbine from 25 to 30 per cent efficient, and the Diesel from 33 to 37 per cent efficient. Moreover, the Diesel's savings in operation will equal its purchase price within six to eight years, and frequently in far less time than that. Passenger Diesels assigned to preferred runs often earn their entire cost within two and a half to four years. At least one is said to have paid for itself within one and a half years.

With this degree of efficiency, it is not surprising that railroads not dependent upon hauling coal for a large part of their revenue are making as rapid a transition as possible to Diesel locomotives. Roads dependent upon coal for their revenue cannot afford to put Diesels on their freight-hauling trains. It is these roads that will profit from the coal-burning gas-turbine locomotive when (or if) it becomes an assured success in actual road operation.

Conversion of roads which are almost entirely Dieselized is frequently hastened in order to eliminate expensive facilities needed to keep the few remaining steam locomotives in operation. In late 1945 it was estimated that 75 per cent of all steam locomotives then in service were more than 22 years old, and that more than 18,000 had outlived their life expectancy of 30 years. Many of these have since

been retired either temporarily, to be repaired, modernized, and returned to service, or else permanently.

Although the life expectancy of a steam locomotive is said to be thirty years, constant overhauling and replacement of parts is necessary, so that in many cases long before thirty years have elapsed not a piece of the original engine remains intact, and it has completely lost identity with the locomotive originally placed in service. This constant loss of time is expensive from the standpoint of availability, as well as from the necessary overhead for repairs and replacements. So far, the Diesels have required very little loss of time for repairs. This is one factor which has cut their operating expense to the minimum.

Furthermore, the average steam locomotive is said to cover approximately one and a half million miles in its thirty-year life span, whereas it appears from the eleven-and-a-half-year record that the Diesels will have completed three times this mileage before they are fifteen years old. The two oldest Diesels on the road, the Zephyrs running between Chicago and Denver, have already covered nearly four million miles in their eleven-and-a-half years.

The number of Diesel passenger locomotives almost exactly doubled during the eighteen months between January 1, 1946, and July 1, 1947. On the latter date, the total freight Diesel inventory was ten times as great as in 1943.

Max Ball, of the Oil and Gas Di-

vision, Department of the Interior, recently said that the "present demand by the railroads for Diesel locomotives may soon force coal-burning locomotives off the road at a time when the country is already short of oil and has little chance of getting relief." He predicts that the trend to Dieselization will continue unless manufacturers of coal locomotives modernize their product.

Fuel Consumption by Railroads

Although coal constituted 80 per cent of all fuel used by Class I railroads in 1940, it had decreased to 70.3 per cent by 1946. More than a fifth of our annual national production of coal is purchased by the railroads, ranging normally from 80 to 125 million net tons a year depending upon the level of business activity.

Bituminous coal used by Class I railroads increased from 86,391,000 net tons in 1936 to 132,049,000 net tons in 1944 because of heavy war-time demands. Since the war, and also because of increased use of Diesel locomotives, coal consumption dropped to 110,406,486 tons in 1946, and 113,372,673 tons in 1947. Increased efficiency in coal consumption by steam locomotives accounted for some of this drop in tonnage used.

Fuel oil consumption increased from 54,322,524 barrels in 1935 to 115,563,270 barrels in 1943 (year of highest consumption), dropping to 98,442,414 barrels in 1946, and 96,754,622 barrels in 1947.

On the other hand, Diesel fuel increased from 43,898,000 gallons in 1939 (earliest year for which data

are available) to 559,187,983 gallons in 1946 and 800,591,612 gallons in 1947. It is estimated that 1948 consumption will be approximately 16 per cent above that for 1947.

These figures give some idea of the sharp rate of increase in Diesel fuel consumption as contrasted with gradually dwindling coal consumption. Because of the necessity of retaining obsolete steam locomotives in service during the war, coal consumption naturally was high. Since the war, it has declined; large numbers of obsolete steam locomotives have been retired, and the efficiency of those retained has been increased. Although coal is the most widely distributed and generally the most available type of locomotive fuel, yet curtailed production at the mines and extensive exports, amounting to about 5 per cent of the national bituminous coal production, made it difficult for the railroads to secure adequate supplies of coal during 1947, particularly the grade of coal which they wanted and needed. Stockpiles in some cases were dangerously low on January 1, 1948.

The practice of expecting railroads to accept and burn whatever kinds of coal were not currently needed by industry and for other purposes has resulted in decreased efficiency of railroad service and in increased operating costs. Some locomotives designed for burning high-grade coal proved unable to give satisfactory service with the poor coal supplied to them in 1947. There seems to be a possibility that a better balance between demand and supply may be reached in 1948,

so that railroads will be better able to obtain the grade of coal needed. The railroads may share the responsibility for this situation, if, as has been reported, they were willing to accept an inferior grade of coal because of its lower price. Had they made the same demands upon the coal industry that other industrial concerns made, they too might have been able to obtain a better grade of coal, if, of course, they were willing to pay the difference in price.

Anti-smoke ordinances, as well as the need for increased efficiency in steam locomotives, have been instrumental in bringing about many improvements recently in steam locomotive design that will add greatly to their over-all efficiency and also eliminate much of the smoke menace.

Diesel fuel likewise presents some grave problems. Diesel fuels, light heating oils, and kerosene come from the same fraction in the refining process, and are thus competitive from the supply point of view. To increase the production of one, it might become necessary to curtail production of another.

At present, competition does not limit production of any of these fuels, nor would the demand of 26 million barrels of Diesel fuel predicted for 1950. However, should railroads ever approach complete Dieselization, as some sources predict, it would mean a demand for at least 100 million barrels of Diesel fuel annually.

For those interested in maintaining an ample supply of light heating oil and kerosene, the production of an adequate supply of Diesel

fuel without materially reducing the supply of these other fuels is important.

Fuel, particularly for the heavily Dieselized roads, gives promise of being one of the major problems for Class I railroads in 1948. Coal-burning steam locomotives require six times as many B.t.u. as Diesels for each passenger-car mile, more than seven times as many B.t.u. for each ton-mile of freight, and thirteen times as many B.t.u. for each hour of switching operation. When fuel cost factors were applied to these figures, it was found that Diesels saved 45 per cent of fuel cost in passenger service, 56 per cent in freight service, and 75 per cent in switching service.

Effect of Synthetics on Price Trends

Not only must railroads face the problem of an adequate supply and desirable quality of fuel, but fuel costs have risen to approximately 10 per cent of their total operating expenses. Total fuel costs in 1947 for Class I railroads are estimated to have reached \$675,835,000. The following tabulation shows purchases of fuel by these railroads, 1940-1946.

Year	Fuel Purchases (000)
1940.....	\$273,556
1941.....	349,765
1942.....	426,335
1943.....	527,296
1944.....	585,832
1945.....	555,155
1946.....	553,153

Prices of all fuels have risen sharply since the war, and doubts

are currently expressed that liquid fuels will long continue to be available at a price competitive with raw coal. Although our reserves of crude oil are rapidly being depleted by the recent unprecedented demands, yet the knowledge of methods for synthesizing almost any hydrocarbon assures a future supply of liquid and gaseous fuels if the costs do not prove to be prohibitive.

It is true, however, that the price of all petroleum-based fuels is likely to approach constantly nearer the price of gasoline at the refinery, gasoline being the largest single component in the demand for liquid fuels. An article in *Railway Age* for January 31, 1948, says, "To meet the almost insatiable demand for gasoline, the oil refineries have developed cracking processes which can convert increasing amounts of each barrel into distillate fuels, thus leaving less and less residual oil. Even that residue which is now left can be largely converted into gasoline by the process of adding more hydrogen to the hydrocarbon molecules."

Nevertheless, the ability to produce synthetic fuels from coal and natural gas does not alter the fact that they are certain to cost substantially more than an equivalent B.t.u. content of either natural gas or raw coal. Plants required would be expensive; huge quantities of steel would be required; and under present methods of synthesis, extravagant quantities of coal or natural gas would be consumed. Much opposition is being expressed to any immediate plans for build-

ing synthetic fuels plants, because of the seemingly unnecessary expenditure of vitally needed steel and the waste of natural resources involved.

Bruce K. Brown, President of the Pan American Petroleum Transport Corporation, maintains that it would take a smaller expenditure of steel and less waste of natural resources to import and store against future need adequate supplies of oil than to launch an ambitious program of synthetic fuel oil production. According to Mr. Brown, to provide the suggested 2 million barrels of oil daily (Krug-Forrestal plan) would necessitate using 468 million tons of coal a year, which is more than two-thirds of our highest annual production. This would revolutionize the coal industry. Or again, to secure even 500,000 barrels daily would require consumption of half as much gas annually as was produced in 1946, in addition to the large quantities of steel needed.

Emphasizing the fact that he is not opposed to synthetic fuel production, Mr. Brown maintains that such a development should come gradually over a period of years and not like a forced wartime measure.

High steel requirements for the synthesizing process are also a factor that cannot be ignored in view of the inability of the steel industry to supply the already unprecedented demand today. Production of 500,000 barrels of oil daily from natural gas would require 3,500,000 tons of steel, and production of the same amount from coal

would require twice as much steel, whereas preliminary estimates by promoters of the government plan reach the staggering figure of 16,000,000 tons of steel, with no assurance that even that amount would prove adequate to do the job. Oil people are convinced that even a small proportion of the steel involved in this suggested government project would be of great help in balancing oil demand and supply, and that moderately increased amounts would help to create a great reserve capacity for future emergency needs.

Based on prices paid by a number of American railroads in August, 1947, of \$3 to \$5 a ton for coal and 6.5 cents to 8.3 cents a gallon for Diesel oil, the estimated cost at that time per million B.t.u. was approximately 16 cents for coal and 65 cents for Diesel oil.

Although railroads are still paying approximately the same for coal, Diesel fuel has risen to around 11 cents a gallon, bringing the cost to approximately \$1.00 per million B.t.u. at present.

The Present Outlook

The facts thus far discussed lead to the question: What effect will the cost and uncertain future of Diesel fuel have on the present trend toward complete Dieselization by Class I railroads?

At present, using 1947 figures of locomotives on order as a basis, it seems that the efficiency and satisfaction given by the Diesels have as yet outweighed any factors to the contrary. Of a total of 2,155 domestic orders in 1947, 2,075 were

for Diesels, 79 for steam, and one electric. This was the largest number of locomotives ordered in any one year since 1922, when 2,600 were ordered. Of new locomotives placed in service during 1947, 72 were steam, 2 electric, and 769 Diesel. Thirty steam and 1,192 Diesel locomotives were on order January 1, 1948. These figures indicate the immediate large demand for distillate oils.

Consumption of Diesel fuel by Class I railroads in 1947 is estimated to have risen about 42 per cent from 1946 and shows signs of increasing still further in 1948. Although oil imports may ease this situation slightly, the picture is dark in spite of the voluntary rationing of consumers by some oil producers. While the situation is not critical, it depletes stocks that are none too large now.

Although 1947 brought a further rapid extension in the use of Diesel locomotives, with a number of railroads announcing plans for complete Dieselization of certain divisions, the great bulk of rail transportation service is still rendered by reciprocating steam locomotives, which are also being improved in

design, maintenance, and efficiency. Table 1 shows the types of locomotives in service in recent years, irrespective of size or capacity. Figures for 1940 to 1944 are those reported by the Interstate Commerce Commission; data for 1945, 1946, and 1947 were published in *Railway Age*.

Equipment owned by railroads declined in 1945 and 1946, as retirements exceeded installations. In 1947, the roads had the fewest steam locomotives since 1900, and ownership of Diesel locomotives continued its upward trend. The number of steam locomotives owned December 31, 1947, was 2,272 less than at the end of 1946, whereas the number of Diesels owned had increased by 675 in the same period. In spite of the great increase in Diesel orders during the past few years, only slightly more than 10 per cent of the locomotives in service today are Diesels. The rapidity of the trend toward Dieselization obscures the fact that nearly 90 per cent of road-freight-hauling service is still performed by steam locomotives. The proportion of Diesel operation in passenger service is somewhat higher—roughly

TABLE 1.—LOCOMOTIVES IN SERVICE, 1940-1947

Year	Total	Steam	Electric	Diesel
1940.....	41,696	40,041	858	797
1941.....	41,748	39,624	857	1,267
1942.....	42,013	39,491	855	1,667
1943.....	42,718	39,725	868	2,125
1944.....	43,593	39,681	863	3,049
1945.....	42,413	38,683	*	*
1946.....	41,362	37,072	725	3,565
1947 (10 mo.).....	40,072	35,258	725	4,089

* Electric and Diesel locomotives listed together, 3,730 in all.

one-fourth — and in switching service is approximately 30 per cent.

The decrease in the total number of locomotives is also significant. During the eight years between January, 1940, and January, 1948, one out of every twenty locomotives had disappeared from service. This means that today the railroads, because of their increased efficiency, are able to handle a considerably greater volume of business than in 1940 with nearly 5 per cent fewer locomotives. This, again, results largely from the high efficiency of the Diesels.

A large manufacturer of locomotives predicts that by the end of the first postwar decade 20 per cent of all locomotives will be Diesels, and that these will be doing 40 per cent of the total rail-haulage. Many roads, particularly in the western part of the United States, judging from the large percentage of Diesel orders, are moving toward complete Dieselization. In the East, the proximity of coal fields will make the process much slower. The economy of fuel costs, high availability (actual percentage of time locomotive is available for service), ease of replacement of necessary repairs, shortened schedules because of generally higher speeds, and ease and speed of starting because of greater tractive power give reason to believe that the Diesel is the answer to over-all efficiency in rail transportation today.

Coal-Burning Gas Turbine

These trends of questionable availability and consistently rising costs of the two chief locomotive

fuels have given added impetus to the program of the Locomotive Development Committee of Bituminous Coal Research, Inc., which has been in operation since May, 1945, developing a coal-burning gas-turbine locomotive.

Much interest is being shown in turbine-type power and gas-turbine locomotives, both powdered-coal and oil-fired. Hopes are currently expressed that this committee will be able to place at least one of its locomotives in actual road service before the end of 1948.

A recent progress report by the directors of the coal-burning gas-turbine research program gives an account of what has been accomplished to date, some of the problems encountered and solved, others as yet not solved satisfactorily, and a general description of the principles of operation in this type of locomotive.

The general principles of the coal-handling system are based on the assumption that the gas turbine must be able to burn any ordinary locomotive fuel without special wayside preparation. "Drying, crushing, pressurizing, feeding, and atomizing must be accomplished as the coal is being fed from the bunker by the stoker." A magnetic pulley has been added to remove any iron before the coal enters the hammer mill which pulverizes it. Oil is used as a starting and a stand-by fuel.

The use of Diesel fuel suggests the possibility that, if and when this type of locomotive proves successful, it may be appropriated by the oil interests since it will carry an

auxiliary supply of Diesel oil. This seems to be a very doubtful conclusion. The superior efficiency of the present-day Diesel leaves little to be desired that the gas-turbine is likely to supply, because there is much doubt, even within the coal industry, that the coal-burning gas-turbine locomotive can ever attain the over-all efficiency of the present Diesel. It definitely is the hope and dream of those roads forced to retain coal-burning locomotives, not of the roads which can avail themselves of the advantages of the Diesel and are doing so.

Two gas turbines for coal-burning power are now under construction: one by the Elliott Company to be housed in a locomotive being designed by the Baldwin Locomotive Works, and another by the Allis-Chalmers Company to be housed in a locomotive being designed by the American Locomotive Company.

As soon as these units operate satisfactorily in extensive tests at the manufacturers' plants, they will be installed in the locomotives being built for them and will be given road tests. Operator's cabs will be provided at each end to eliminate the necessity for turning the locomotive. Six-wheel trucks, identical to those now used on Diesel-electric locomotives, will be employed to provide for interchangeability and to make use of maintenance facilities now available.

It is anticipated that these locomotives will be able to carry from 17 to 20 tons of coal, approximately 4,000 gallons of water for the train-

heat boilers, and about 1,500 gallons of Diesel oil. Full-load fuel consumption is expected to be approximately one pound of 13,000-B.t.u. coal per rail hp.-hr.

The major advantage of the gas turbine will be its ability to burn low-cost coal. Although the thermal efficiency of the Diesel is higher, the cost of fuel for the gas turbine will probably be about one-third that of a Diesel, one-third to one-fourth that of a modern steam locomotive, and approximately one-eighth to one-tenth that of the older steam locomotive. The gas turbine will likely be able to burn the cheapest type of coal on the market.

What Lies Ahead for Coal?

In considering coal as a railroad fuel, the question that immediately presents itself is: What will be the probable over-all coal requirements of the railroads for the next several years? More than half of the steam locomotives in service are more than thirty years old and fewer than 5 per cent have been built within the past ten years. Naturally, locomotives which have outlived their normal life span are not doing efficient work according to modern standards for even the regular reciprocating type of steam locomotive. However, this picture of the comparative efficiency of steam and Diesel locomotives is somewhat distorted, in view of the fact that the rate of coal consumption for obsolete models is naturally much greater than that of modern steam locomotives. Moreover, the older models, which were kept in service

during the extreme pressure of wartime demands long beyond the period of normal retirement, are now being retired in large numbers and, if practicable, improved, repaired, modernized, and returned to service. Thus, despite the preponderance of new Diesel locomotive orders placed in 1947, if these reconditioned steam locomotives are counted, there were actually more steam than Diesel installations during the year. Consequently, unless coal-burning locomotives continue to be modernized and improved, even further inroads into the locomotive market are certain to be made by the Diesel.

As to the effect of trends in steam locomotive operation on fuel consumption, naturally the improvements in efficiency and design have materially reduced fuel consumption per unit. The coal industry is particularly interested to know what type of locomotive will be selected to replace many of the steam locomotives in service today. Availability and cost of fuel, traffic influences, and cost of maintenance and operation are determining factors in the choice of locomotives.

If the coal-burning gas-turbine locomotive now under development proves to be all that its inventors expect, it may revolutionize coal production, reduce railroad fuel costs, and effectively turn the tide of Diesel competition. Otherwise, there seems little doubt that both increased use of Diesels and increased efficiency in the newer steam locomotives will bring about a gradual but constant decline in

coal consumption by the railroads. However, industrial demands upon the coal industry are increasing so rapidly that they will undoubtedly more than absorb any such decrease.

By 1946, 2,000 fewer steam-locomotives were maintaining approximately the same aggregate tractive effort as in 1940, and increased use of Diesels was taking care of more than the increase in traffic. This is another proof of the increased efficiency in the steam locomotives which remain in service. One of the most important details contributing to this increased efficiency is improved combustion of fuel. Anti-smoke ordinances have been a contributing factor in these improvements because black smoke means imperfect combustion. In some cases, overfire air jets, injecting extra air into the firebox to insure better combustion, have been adopted.

If the coal-burning gas-turbine locomotive proves successful, it is possible that the trend toward increased Diesel oil consumption and decreased coal consumption may suddenly be reversed, because the turbine locomotive is expected to have an initial cost approximately that of a Diesel, but decidedly lower fuel costs, to be able to use the same maintenance facilities, and to have equal or greater efficiency.

The future trend of locomotives will depend, after all, upon the economics of the situation. Railroads will put into use the type of locomotive which will net them the greatest return for the capital invested. Factors to be considered

are: initial cost, economic life (including frequency of repair and cost of operation, as well as life expectancy), thermal efficiency of the fuel required, and adaptability to traffic demands.

Whether the coal-burning gas-turbine locomotive is coming too late to affect the trend toward Dieselization, or whether in time it will produce as revolutionary changes as has the Diesel in the field of rail transportation, are questions of current interest, but cannot be answered today. The Association of American Railroads makes the following conservative and qualified report of the coal-burning gas-turbine and its possible effect:

"When this locomotive has been developed, it will have most of the advantages of the Diesel as well as those of the steam-turbine locomotive, without the complication of reciprocating parts and steam boilers possessed respectively by those motive-power units. If calculations of attainable efficiency are correct, it is hoped that more than twice the Diesel mileage can be achieved per dollar of fuel cost, because of the lower price of coal as compared with oil. When and if petroleum reserves approach exhaustion, and coal becomes the principal source of oil, this type of coal-burning locomotive, if successful, may make it unnecessary to convert coal into oil to burn in locomotives to secure the advantages of Diesel motive power, but the economics of this question remain to be determined."

Conclusions

In summary, then, what do current trends indicate as to the future of railroad fuel?

(1) Neither constantly increasing fuel prices, nor the current alarm concerning shortages of petroleum reserves, has caused any decline in the large proportion of orders for Diesel locomotives or, so far as can be determined, in the planning for the ultimate complete Dieselization of many lines.

(2) There is no indication at present that fuel prices, particularly those of Diesel fuel, are not on the permanent upgrade, especially if and when synthetic fuels become necessary.

(3) The fact that coal furnishes the railroads more revenue than any other commodity has not deterred them from transferring, wherever possible, to Diesel locomotives for greater efficiency. Even the major coal-hauling roads are using Diesels on their passenger trains and for switching service.

(4) If successful, the coal-burning gas-turbine locomotive could produce as revolutionary a change in the trend of locomotives and locomotive fuel as the Diesel has within the past decade—or it might even give added impetus to the trend away from coal as railroad fuel. There are those who believe it will. However, at present neither of these possibilities seems likely, although predictions as to the effects of this type of locomotive are anyone's conjecture. There is no definite assurance as yet as to what or how far-reaching they will be.

Prerequisites for Sound Tax Reform

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CHANGES in the tax statutes are a perennial matter of inquiry and dispute. Today revisions are again being proposed. The Committee for Economic Development has suggested numerous changes, such as a "stabilizing budget policy" (a long-range budget), cutting of tax rates, elimination of many excise taxes and the double taxation of dividends, broadening the social security provisions, and permitting the averaging of incomes over a period of years. The Republican-controlled Congress has twice voted for systems of income tax reductions, but these have been vetoed by a Democratic president. The Republican party is again suggesting rate slashes, whereas President Truman proposes cutting taxes in the lower brackets through the medium of a uniform dollar tax exemption for each taxpayer and his dependents, the loss of revenue to be made up by increased corporation taxes. There is a growing clamor for the elimination of the tax advantage held by the residents of community property states. Every class of citizen seems to be demanding tax relief or more favorable treatment from the tax gatherer.

The plea for change seems no louder and yet not less loud than usual. In every period of our history people have been dissatisfied

with the existing tax structure. Part of this feeling is due to a general antipathy to taxes. But much of it arises from the fact that we have not been willing to undertake a real reform of the tax system. For the most part we make a few changes in an attempt to remedy the worst defects—or to give the currently dominant political power credit for some tax advantages. Many proposals have been worth while and must be included in any far-reaching tax reform. But this method of attacking the problem cannot by itself be successful. Where one minor source of irritation or inconsistency is eliminated, two spring up.

We have been unwilling to decide the really basic issues of the tax system. Changes are proposed without knowing just what the tax system ought really to do and be like. Under such circumstances it is too much to expect that such proposed changes will fit into a consistent pattern. For too long we have been doing a little clearing in our tax forest without even keeping pace with the undergrowth, let alone developing a plan for the orderly propagation of the forest. What is needed for satisfactory tax reform is a decision on five basic issues. Once these decisions are made, specific measures can be fitted into the over-all structure. If they are not

made, tax discussion will continue in its present unsatisfactory course.

The Five Basic Issues

The five basic decisions concern: (1) the ultimate objective of the tax system; (2) the period of time for which fiscal planning shall be projected; (3) whether taxation shall be based on persons, or on things, or on both; (4) whether all governments should coordinate their tax policies; and (5) whether we are really willing to enforce such rates of taxation as are imposed.

(1) *The Ultimate Objective.* Hitherto it has generally been accepted that the purpose of a tax system is to raise money. Economic and social consequences were largely disregarded. More recently, concern has been expressed about such effects, but, with few exceptions, the discussion of economic and social effects has taken place within a general belief that the real purpose of a tax system should be to raise revenue. Any consideration given economic or social consequences was to be in the direction of minimizing them.

With this as the objective of the tax system, the chief criterion of a good system was inevitably justice as among individuals. All proposed changes were to be tested in this light. Inevitably also it was to be expected that each person, or class of persons, would feel that he was paying more than his fair share of taxes. Since we are all jealous of our pocketbooks, debate was bound to be acrimonious, and each group which obtained political power might be expected to further its

own interest when the almost annual review of taxes took place. Recently, moreover, it has been charged that proposed tax changes are used as political bait.

Over a period of time, economists have developed various theories as to what constitutes fairness as among individuals. Equal payment, cost of service, benefit, and ability to pay are familiar tests of fairness. Today almost everyone will agree that the last is the soundest test of fairness. Nevertheless, there is considerable dispute as to what specific rates would make the tax system accord with such a criterion of justice.

So long as we adhere to a standard of taxation which takes as its sole basis justice as among individuals we cannot hope to get reasonable agreement. So long as the chief test is the proper share of each class, each class will fight to impose a larger share on the others. Under these conditions no long-range tax policy can have any hope of success. We are doomed to annual bickering over specific rates and relatively petty measures.

It may seem illogical to maintain that the chief purpose of a tax system should be something other than the raising of revenue. Yet, recently there seems to be a growing belief that there is a more important objective—the welfare of the economic system as a whole. A large part of tax discussion today is in terms of the effects of taxes on the economic society. A few, moreover, have taken the important step of setting up such an objective as the primary standard by which

each tax proposal shall be judged. No longer would the burden placed on a particular class be the prime test; this obviously cannot be disregarded, however, just as under a fairness test economic consequences cannot be disregarded. The primary question would be not *who pays the tax* but *whether it promotes a sound economy*.

Careful consideration leads to the conclusion that social welfare is a more basic test than fairness among individuals. Social scientists have usually emphasized the primacy of the rights of society (as distinguished from the nation or the state) against the rights of the individual, although desiring as great private rights as possible, consistent with the rights of the group. Even under the capitalistic system, in which individual rights are given more place than in any other system except anarchism, such rights were conceived as promoting the social good and were to be accepted primarily for that reason. Moreover, the two objectives do not appear inconsistent, once the social welfare objective is made dominant.

Past experience shows that it is unlikely that the tax system will actively promote the social welfare when the chief concern is justice as among individuals. Our tax system has in the past aided boom-bust cycles, although it did not cause such cycles. Even though it had established justice among individuals—but it probably did not do so—the greater injustices caused by the business cycle seem to indicate the value of a different approach. Once we get to thinking in terms

of a sound economy, the question of justice can also be handled—at least, as well as it is today.

It is not to be expected, however, that the standard of social welfare will be easily applied. There has been very little discussion and less agreement as to what social ends should be. Inevitably the same tugs of self-interest will be felt. Each group will tend, as in the past, to identify the social interest with its own interest. Without an objective standard by which to judge the social interest, we might be no better off than we are today.

The most promising test for social welfare, which may ultimately take the place now accorded the ability-to-pay theory, is that of the size and stability of the national income. Although not a positive remedy for every economic and social ill, such a test seems to be the best all-round guide to policy. If we could maintain national income at a high level and could escape such disasters as the drastic fall in national income which occurred in the 30's, our other economic problems would, in comparison with their present status, sink into insignificance. Particularly, the problem of justice among classes would be much less pressing than it is now. Much of the difficulty among groups arises from the attempt of each to protect itself against the effects of depression. Maximum output rules of labor unions are of this nature and would be unnecessary if full employment were assured.

Economic science has come a long way in determining what meas-

ures do or do not promote a high and stable national income. Unfortunately, public policies are not integrated toward that end. Each sphere of governmental action has its own objectives. It is not unusual for two departments to be pursuing opposite ends. The structure of the tax system itself is no exception. Until a common goal is adopted, governmental action is certain to appear confused and inept. What better primary goal than a sustained high level of production!

With such a test adopted as a primary one, and considerations of justice playing a subsidiary but unforgotten role, economic science could develop more objective standards of taxation than now exist. Reasonably accurate measurements can be made statistically of the effects of a proposed tax change on the national income. The flow of money taxed away or left in the hands of individuals and its effect on the economy are fairly objective matters (although subject to some dispute).¹ The correct shape of a tax-rate curve which is "just" is a subjective matter and wholly indeterminable. The national-income test offers hope that a less confused tax policy can be developed. It also offers hope for tax principles which can be applied consistently over long periods.

To get such a standard of taxa-

tion accepted would be very difficult, as is evidenced by the fate of the Full Employment Bill. It is no accident that there are many, usually the conservative forces, who regard such a proposal as more dangerous than communism to their position. This attitude is not without reason, at the moment. The goal of a stabilized, high-level national income would probably call for a more progressive tax system than obtains today (considering all taxes of all governments). The proposal that such a criterion be adopted will undoubtedly be called socialistic, communistic, and other disparaging terms usually reserved for unwanted measures. It certainly would not be communistic and need not even result in more governmental intervention, although it would probably lead to a different tax system. In that tax system, however, one of the important considerations would necessarily be that of incentives to private business. Far from being an excuse for more governmental intervention, the national-income concept may ultimately turn out to be the method of reasoning by which the private enterprise system is enabled to survive.

Whatever the result on economic policy and the tax system, the national-income concept seems a most useful device for deciding public policy. The exact measures would be decided by the consensus of qualified persons. The important consideration here is that it is the one device which promises to establish some sort of order in our tax system. It is important that the people

¹ Although the *amount* of money taxed away from all individuals, considered as an entity, can be measured with fair accuracy, the *incidence* of a tax on individuals, a prerequisite for a system of taxation based on fairness among individuals, cannot be traced definitely.

consider this possibility as the proper criterion for tax policy.

It is not to be inferred that tax policy alone can attain the end of constant full employment. There is no one cure for depression, as has sometimes been mistakenly assumed in the past. Our economic system is so complex that no single policy can suffice to prevent depressions or inflations. What is needed to achieve such an end is a whole series of coordinated policies in every sphere of economic activity. The tax structure should play an important part but it can be only a part of a determined attack on the business cycle.

(2) *Period for Fiscal Planning.*

Next to be considered are the imposition of taxes and the determination of tax rates as an annual or biennial affair. The existence of the yearly calendar focuses attention on short-run affairs and causes the neglect of long-range thinking. We can no longer afford the luxury of an annual budget and an annual fight over tax policy. If we are to accept as our first standard of taxation that of a sustained, high-level national income we must be prepared to accept the long-range budget (proposed by C. E. D. as a "stabilizing budget policy"). Under such a budget, tax policy would be designed to yield a balanced budget not in any one year, but only over a period of years. Rather, it would be devised to yield surpluses in good years and result in deficits in bad years, thus aiding in the fight against cycles instead of accentuating them as the present system does.

To achieve this result the tax structure would have to be such that the tax receipts would fluctuate with the national income. Stable rates over long periods of time are implied. Changes would occur only to adjust the tax structure to the needs of long-run, full employment. Presumably this proposal requires heavier reliance on income taxes and less on excise taxes, demanding more political courage for its adoption than is now in evidence. Moreover, there would probably be a long period of experimentation before a level of rates could be determined which would accomplish the desired end. The adoption of the long-range budget would improve the tax structure, but would be unlikely to make it perfect.

(3) *Bases of Taxation.*

We must decide whether we are to tax persons or things or, if both, the extent to which we should tax each. Basically, taxation should be on individuals and their incomes except as other types of taxation may be necessary for regulatory purposes. Today a large part of our revenue is derived from taxation of things. Since ultimately these taxes are paid by persons, injustices arise, for no system has been devised to correlate business and property taxes, as they fall on individuals, with the requirements of a just tax system. So long as the tax system is based on raising revenue from whatever source seems expedient at the moment, sound tax reform is impossible. Taxes on persons and their incomes are suggested as the appropriate basis for a tax system. Taxes must be paid out of income

and should be based on income. Taxes on business and property would remain—but only as they may be required for regulatory purposes. Such a basic decision would do much to eliminate difficulties in making a suitable compromise between corporation and personal income taxes, for example.

(4) *Coordination by Governments.*

A sound tax system depends upon the coordination of the tax systems of the Federal, state, and local governments. This proposition has been constantly before the country, but little progress has been made toward its solution. The larger governments are encroaching more and more on the "tax preserves" of the smaller units, forcing the latter to resort to questionable sources such as sales taxes. Enormous problems of domination of one unit by another, the coordination of functions, and the economic differences between areas must be met if any success is to be obtained. Coordination is not easy. Yet it is a requisite to sound financing and to concerted fiscal action aimed at combating the cycle. Government finance is so important a part of the American economy and so influential a tool of social control that the actions of the state and local governments cannot be allowed to offset the conscious fiscal policies of the Federal government.

(5) *Enforcement of Tax Rates.*

Finally, a sound tax system will require a set of rates which we are willing to enforce rigorously and apply against all types of income. Today nominal tax rates are high.

Effective tax rates, however, are far different. There are many loopholes in tax laws so that much income escapes. The tragedy is that not all can utilize the loopholes equally. Those who cannot do so suffer under rates which must be set high enough to get the required revenue from the income which is taxable. Some escape taxation to an appreciable degree; others are hit extremely hard. The result is unfairness in a tax structure supposedly based on fairness. In a tax structure based on economic welfare, the system of avenues to escape from taxation would interfere with the attainment of the chosen objectives. If all income were taxed, the tax rates could be appreciably lower and yet yield as much revenue as is obtained today.

None of these five proposals is new. Each has been advocated many times. But no serious effort seems to have been made to carry them out, either one by one or as a coordinated program. A sound revenue system depends, however, on reaching appropriate decisions on all these matters. It will not be easy to reach such decisions, for the financial position of individuals will be affected. Past experience indicates that favorable decisions are not likely in any foreseeable future. This outline of a framework for a less confused tax system is not presented in the expectation that it will be adopted. Unfortunately, the expectation is that there is no such likelihood. Yet only by sound, long-range planning can we hope for improvement in our muddled tax structure.